Synthesis, Characterization and Oxygen Adsorption Properties of Substituted

Aluminophosphate ($AlPO_4$-5, AFI) Zeolites

by

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ABSTRACT

The objective of this research was to develop Aluminophosphate-five ($AlPO_4$-5, AFI) zeolite adsorbents for efficient oxygen removal from a process stream to support an on-going Department of Energy (DOE) project on solar energy storage. A molecular simulation study predicted that substituted $AlPO_4$-5 zeolite can adsorb O_2 through a weak chemical bond at ambient temperature. Substituted $AlPO_4$-5 zeolite was successfully synthesized via hydrothermal crystallization by following carefully designed procedures to tailor the zeolite for efficient O_2 adsorption. Synthesized $AlPO_4$-5 in this work included Sn/AlPO-5, Mo/AlPO-5, Pd/AlPO-5, Si/AlPO-5, Mn/AlPO-5, Ce/AlPO-5, Fe/AlPO-5, CuCe/AlPO-5, and MnSnSi/AlPO-5. While not all zeolite samples synthesized were fully characterized, selected zeolite samples were characterized by powder x-ray diffraction (XRD) for crystal structure confirmation and phase identification, and nitrogen adsorption for their pore textural properties. The Brunauer-Emmett-Teller (BET) specific surface area and pore size distribution were between 172 m^2/g - 306 m^2/g and 6Å - 9Å, respectively, for most of the zeolites synthesized. Samples of great interest to this project such as Sn/AlPO-5, Mo/AlPO-5 and MnSnSi/AlPO-5 were also characterized using x-ray photoelectron spectroscopy (XPS) and energy-dispersive x-ray spectroscopy (EDS) for elemental analysis, scanning electron microscopy (SEM) for morphology and particle size estimation, and electron paramagnetic resonance (EPR) for nature of adsorbed oxygen. Oxygen and nitrogen adsorption experiments were carried out in a 3-Flex adsorption

apparatus (Micrometrics) at various temperatures (primarily at 25^0C) to determine the adsorption properties of these zeolite samples as potential adsorbents for oxygen/nitrogen separation. Experiments showed that some of the zeolite samples adsorb little-to-no oxygen and nitrogen at 25^0C, while other zeolites such as Sn/AlPO-5, Mo/AlPO-5, and MnSnSi/AlPO-5 adsorb decent but inconsistent amounts of oxygen with the highest observed values of about 0.47 mmol/ g, 0.56 mmol/g, and 0.84 mmol/ g respectively. The inconsistency in adsorption is currently attributed to non-uniform doping of the zeolites, and these findings validate that some substituted $AlPO_4$-5 zeolites are promising adsorbents. However, more investigations are needed to verify the causes of this inconsistency to develop a successful $AlPO_4$-5 zeolite-based adsorbent for oxygen/nitrogen separation.

I dedicate this work to my mother, sister and brothers who have stood with me throughout the whole journey and supported me when I needed support the most. It would have been exceedingly difficult without emotional support. Thank you, family!

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CHAPTER 1

BACKGROUND AND INTRODUCTION

Arizona State University (ASU) is leading a DOE project on solar energy storage. In the proposed system, nitrogen is used as an inert sweep gas to remove oxygen generated in the thermochemical (Task 3) and hydrogen (Task 4) reactors. The outlet streams of these reactors are, therefore, a mixture of nitrogen and oxygen with O_2 concentrations between 1-20% at high temperatures (650-1450°C). As shown in the project overview in Figure 1, there is a need to remove the oxygen from the inert sweep gas stream and recycle the purified nitrogen gas back to both the thermochemical and the hydrogen reactors. Figure 1 is an overview of the ASU's DOE project on solar energy storage.

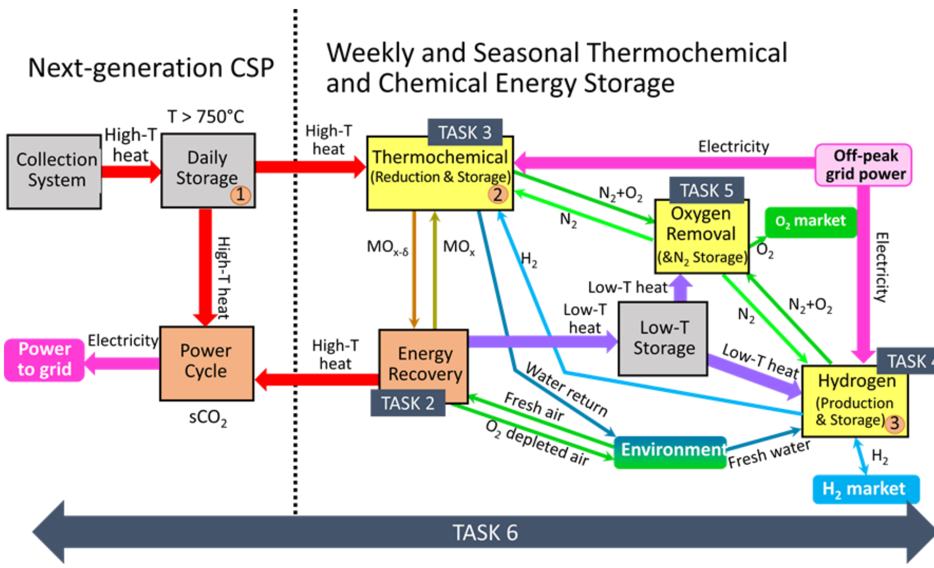


Figure 1. Overview of ASU's DOE project on solar energy storage.

The research work presented in this thesis is part of Task 5 efforts in this DOE project. The main objective of this research is to identify and develop a suitable adsorbent that is capable of removing oxygen from an oxygen-nitrogen gas mixture containing 1-20% of O_2 and produce a relatively pure nitrogen gas containing less than 1000 ppm of O_2. Once a suitable adsorbent is identified, adsorption process design and optimization will be performed to achieve the project goal.

Air separation to produce pure nitrogen and oxygen can be achieved by cryogenic distillation and non-cryogenic processes that include adsorption and membrane technologies. Adsorbents commonly used for air separation in a pressure swing adsorption or vacuum swing adsorption process are zeolites, carbon molecular sieves and perovskite materials[(1)]. Removing oxygen from an oxygen-nitrogen mixture for the production of pure nitrogen is still quite challenging. There is an urgent need to develop more efficient adsorbents with high selectivity and large oxygen uptake capacity to reduce energy consumption and minimize the cost of this process. Among the materials listed previously, my team has particularly been interested in microporous zeolite materials typically of pore sizes greater than 4Å because some microporous zeolites have high surface areas and have shown potential for oxygen adsorption at lower temperatures in studies conducted by the team.

A previous study by Hong et al. [(2)] indicated that it is possible to tailor the selectivity of the zeolite $AlPO_4$-5 to adsorb specific gases by inducing paramagnetic defects.

These defects can be induced by introducing foreign atoms into the structure of $AlPO_4$-5 to substitute either Al sites, P sites, or both Al and P sites. The type of heteroatom substituted and the nature of the substituting atom largely influence the selectivity of the material [(2)]. Another study by Kim et al.[(3)] showed some adsorption of oxygen in defected

$AlPO_4$-5 molecular sieves at room temperature with oxygen concentrations of $8.7x10^{-18}$ cm^3/g as O_2 and $1.6x10^{-6}$ cm^3/g as O_2^-. The adsorption capability of these defected structures is attributed to the electron transfer between the defect center and the oxygen molecule[(4)]. $AlPO_4$-5 molecular sieves are formed by a network of alternating AlO_4^- and PO_4^+ tetrahedra, resulting in a 12-member ring that is electrically neutral and if perfect crystals do exist, a perfect $AlPO_4$-5 molecular sieve would not have any adsorption capability towards oxygen. Figure 2 is a structure previously reported by Wilson et al.[5] that shows the top view of the AFI structure.

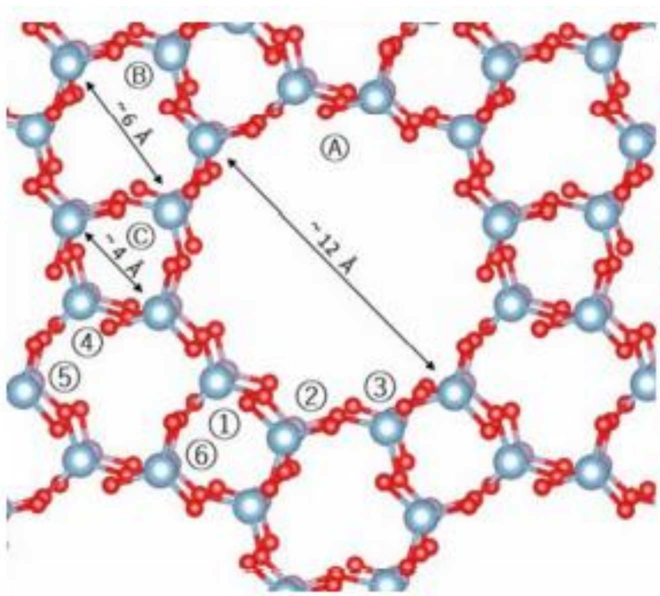


Figure 2. Top view of the AFI structure[5].

In the study by Wilson et al.[(5)], it was found that it is possible for some of these defected $AlPO_4$-5 crystals to adsorb oxygen at low temperatures when the following occurs; Al rather than P is singly substituted, and the substituting atom is one of these transition metal atoms among those studied; Si, Ge, Sn, Pd, Pt, Ti, V, Cr, Mn, Zr, Mo, Hf, W, Ce, and Pr. This work provides experimental validations of some of Wilson et al.'s work thereof through synthesis and characterization, but also, identifies an alternative high surface area adsorbent for oxygen adsorption through improvement of the single-metal substituted $AlPO_4$-5. MnSnSi/AlPO-5 is discovered to have a high capability for oxygen adsorption, even though, the zeolite's oxygen adsorption capacity is inconsistent among specimens of the same sample batch investigated. The investigation of oxygen adsorption in the MnSnSi/AlPO-5 with the discovery made here is first of the kind. In general, multi-metal substituted $AlPO_4$-5 have been largely studied for catalytic activity and special functional-group polar compounds adsorption rather than oxygen adsorption(6-8). Even more interesting, there have not been identified studies specific to MnSnSi/AlPO-5.

While it is apparent that mechanisms of formation of these $AlPO_4$-5 molecular sieves are not well-understood even with literature such as that published by Hong et al. (2), equations to represent the pathways through which substitution could occur are offered in this work.

$$2Sn\mathrm{O}_2 \xrightarrow{Al_2O_3.[P_2O_5]} 2Sn_{Al}^{\circ} + 2\mathrm{e}^- + 3O_o^x + \frac{1}{2}O_2 \qquad [1]$$

$$2SnO_2 + \frac{1}{2}O_2 \xrightarrow{[Al_2O_3].P_2O_5} 2Sn_P' + 2h^{\circ} + 5O_O^x \qquad [2]$$

$$2SnO_2 \xrightarrow{[Al_2O_3].P_2O_5} 2Sn_P' + V_O^{\circ\circ} + 4O_O^x \qquad [3]$$

Note the usage of the brackets in the equations. Al_2O_3. $[P_2O_5]$ represents substitution at Al sites and vice versa. Ideally, substitution should occur via Equation 1 exclusively for oxygen adsorption to occur. Substitution via Equation 1 suggests charge compensation via electrons and this is consistent with the electron transfer theory by both Hong et al. [(4)] and Wilson et al. [(5)]. Alternatively, substitution could occur with charge compensation via holes or anion vacancies and do not necessarily involve electron transfer as seen in Equations 2 and 3. As a result, substitution via Equations 2 and 3 will most likely result in adsorbents that do not adsorb oxygen.

CHAPTER 2

LITERATURE SURVEY ON ZEOLITE SYNTHESIS

While a lot of literature has been published on conditions that influence the $AlPO_4$-n formed in a synthesis, there is not so much known about the mechanisms of formation of these materials. Most literature, however, agreed on the general process of the zeolite's synthesis from the initial stage of reaction, hydrothermal crystallization, washing and drying, to calcination[8-11]. Weitkamp, Karge, and Pfeifer [12] outline some key steps of zeolitization that align with the previous statement, but also include a step known as "ageing" to the list of important steps. The ageing process usually involves keeping the gel for a certain period of time below the crystallization temperature, and according to the authors [12], this ageing step is very crucial in achieving a given product at a given rate. Weitkamp and colleagues also discussed the factors affecting zeolitization that include: Molar composition of the hydrogel that is generally expressed in terms of the oxide formulae of the elements that form the material. Alkalinity i.e., pH of the gel is key in obtaining the correct material especially in terms of morphology/ shape and pore size.

Duration and temperature; temperature and time are said to have a positive influence on the zeolitization in that an increase in temperature is expected to increase both nucleation and linear growth rate of the crystals. The linear growth rate is usually expressed as $k = 0.5\,\delta l/dt$ [12] where l is the crystal size and t is temperature. Temperature also affects the type of products formed as higher temperatures tend to favor the formation of more dense products [12], suggesting, therefore, an upper-temperature limit. For $AlPO_4$-5, a crystallization temperature greater than 185^0C is not common. Regarding duration, it is expected that an increase in time has a corresponding increase in crystallization, but this maybe partially disputed because of Ostwald rule of successive phase transformation which suggests that thermodynamically least stable phases are formed first and replaced in time with more stable phases [(12), (13)]. Other factors include template/ structure-directing agent and its composition, temperature ramp, etc. Suggestions about synthesis conditions by Weitkamp and colleagues [(12)] are in line with findings by Kodaira et al. [(14)] that yield and particle size distribution of $AlPO_4$-5 depend largely on the pH of the starting gel. According to their [(14)] work, reducing the pH from 7.0 to 4.0 was accompanied by an increase in particle size, size distribution, and yield. However, an increase in pH would result in faster rate of crystallization according to Newalkar et al. [(15)]. Dan Li, Jianfeng Lao, and Huanting Wang reported that extended mixing during the ageing process affects crystal morphology[(16)].

For the substituted $AlPO_4$-5, Newland et al. [(17)] discuss possible substitution sites and the rational design of isolated active centers in the material. Also, Kosinov et. al [(18)]. discuss the engineering of transition metal substituted zeolite catalysts. Jagannath Das et al. [(19)] investigated the substitution of Al in $AlPO_4$-5 by Si and Fe using a number of experimental methods including electron paramagnetic resonance (EPR), Mössbauer and magic-angle-spinning nuclear magnetic resonance (MASNMR), and temperature programed desorption (TPD) of ammonia. Yan Xu, Peter Maddox, and John Thomas [(20)] also provide some insight on the preparation and characterization of substituted $AlPO_4$-5 zeolites and the effect of time of reaction and template to acid ratio on the final products. Zhao et al. [21] provide insights on the synthesis of substituted $AlPO_4$-5, specifically Ce/AlPO-5 as a catalyst while using a mineralizing agent HF and confirm substitution of Al(III) by Ce(III). This is a typical case of isovalent substitution. However, in my experiments, most substitution was aliovalent and I refrained from the use of HF as a mineralizing agent for known reasons that the use of F^- would result in a decrease in structural defects in the material [2].

CHAPTER 3

SYNTHESIS AND CHARACTERIZATION

1.Synthesis of $AlPO_4$-5 and Substituted $AlPO_4$-5

1.1.Chemicals for the Synthesis of $AlPO_4$-5 and Substituted $AlPO_4$-5

Table 1. Summary of synthesis chemicals and their vendors

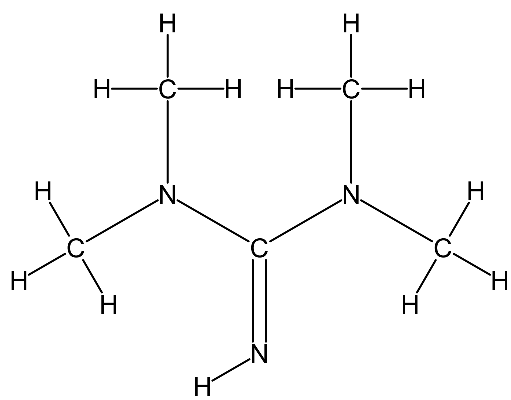
Sample	Chemicals	Purity	Vendor
$AlPO_4$-5	Aluminum isopropoxide (Al(O-i-Pr)$_3$)	98 wt.%	Sigma Aldrich
	Phosphoric acid (H_3PO_4)	85 wt.%	Sigma Aldrich
	Triethylamine ($(C_2H_5)_3N$: TEA)*	>99.9 wt.%	Sigma Aldrich
	1,1,3,3-Tetramethylguanidine (TMG)	99 wt.%	Sigma Aldrich
Sn/AlPO-5[a]	Tin (IV) chloride* pentahydrate	98 wt.%	Sigma Aldrich
	Tin (II) chloride dihydrate.	98 wt.%	Sigma Aldrich
Mo/AlPO-5[a]	Ammonium molybdate tetrahydrate	99.98 wt.%	Sigma Aldrich
Si/AlPO-5[a]	Tetraethyl orthosilicate	>99 wt.%	Sigma Aldrich
Pd/AlPO-5[a]	Palladium (II) acetylacetonate	98 wt.%	Sigma Aldrich
Mn/AlPO-5[a]	Manganese (II) chloride tetrahydrate *	99.5 wt.%	Alfa Aesar
	Manganese (II) acetate	98 wt.%	Sigma Aldrich
Ce/AlPO-5[a]	Cerium (III) nitrate hexahydrate	99 wt.%	Sigma Aldrich
Fe/AlPO-5[a]	Iron (III) nitrate nonahydrate	>98 wt.%	Sigma Aldrich
MnSnSi/AlPO-5[a]			

CeCu/AlPO-5[a]	Copper (II) nitrate trihydrate	99 wt.%	Sigma Aldrich

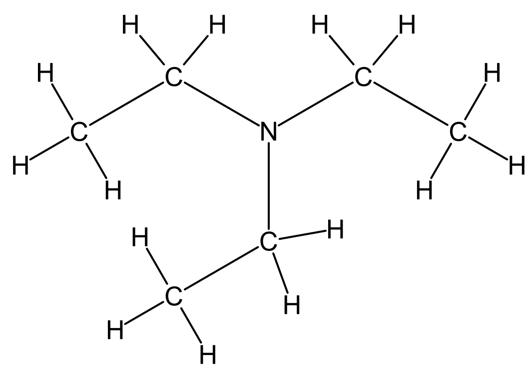
[*] Mostly used in synthesis as compared to counterpart chemical
[a] Other chemicals used, refer to base $AlPO_4$-5

All chemicals for the synthesis of the basic $AlPO_4$-5 and the substituted $AlPO_4$-5 are summarized in Table 1. The respective vendors are also listed and these chemicals were used as purchased without further purification. It is worth noting that the preliminary focus and the main discovery were Sn/AlPO-5 and MnSnSi/AlPO-5 respectively. Some of the materials synthesized were synthesized partly because the chemicals were already available in the laboratory (lab) and did not require purchasing. Therefore, it would not come with additional financial expenses to the project to investigate those materials. Also, using personal funds, I purchased extra lab apparatus such as extra overhead mixers and reactors to ensure the synthesis of the extra materials did not interfere with the speed or timing expectations of the preliminary focus materials.

In regard to chemical usage: Due to availability limitations and handling, the Sn(IV) chemical was used more often than its Sn(II) chemical counterpart even as some published literature suggest Sn(II) would mostly achieve the desired substitution at Al sites than Sn(IV) does [(17)]. While typical thermodynamic considerations may pose important questions regarding the previous statement, it is not ideally up for discussion to stick to the goal of this work. Manganese (II) chloride tetrahydrate was used more often than Manganese (II) acetate because the chloride salt was more available in the lab and did not require purchasing. It is important to note that there were no differences in results whether the chloride or the acetate was used. TEA was used in all successful experiments and TMG was abandoned. This was because the synthesis of the target materials was never successful with TMG as the structure-directing (template) agent as explained in the Experimental Procedures section. It is critically important that the failure to synthesize the samples using TMG should not be interpreted as though TMG is not a good structure-directing agent for $AlPO_4$-5. That is not the point made here. There were so many reasons why the correct structure was not attained with TMG that are independent of TMG. TGM just happened to be a less common template and, therefore, a more common template – TEA – was adopted. For additional clarity, the chemical structures of both TMG and TEA are provided below.



1,1,3,3-tetramethylguanidine (TMG)



Triethylamine (TEA)

1.2. Experimental Procedures for the Synthesis of $AlPO_4$-5

It took precisely 3.2 months to confirm the first correct structure for the basic $AlPO_4$-5, from August 20th, 2020, when school officially began and I began contributing to this project while also working full-time as a teaching assistant to November 27. 3 weeks later, on December 18, the structure of the first substituted $AlPO_4$-5, i.e., Sn/AlPO-5 was also successfully confirmed. Yes, it involved working overtime and weekends to finally get the correct structure, but in here, I explain why it took longer to obtain the first correct structure even in the presence of lots of literature. The procedures used for the synthesis in this work are summarized in Figure 3 with references to published literature [11, 17, 22-28]. The procedures provided in Figure 3 are the final set considered for the synthesis of the basic $AlPO_4$-5.

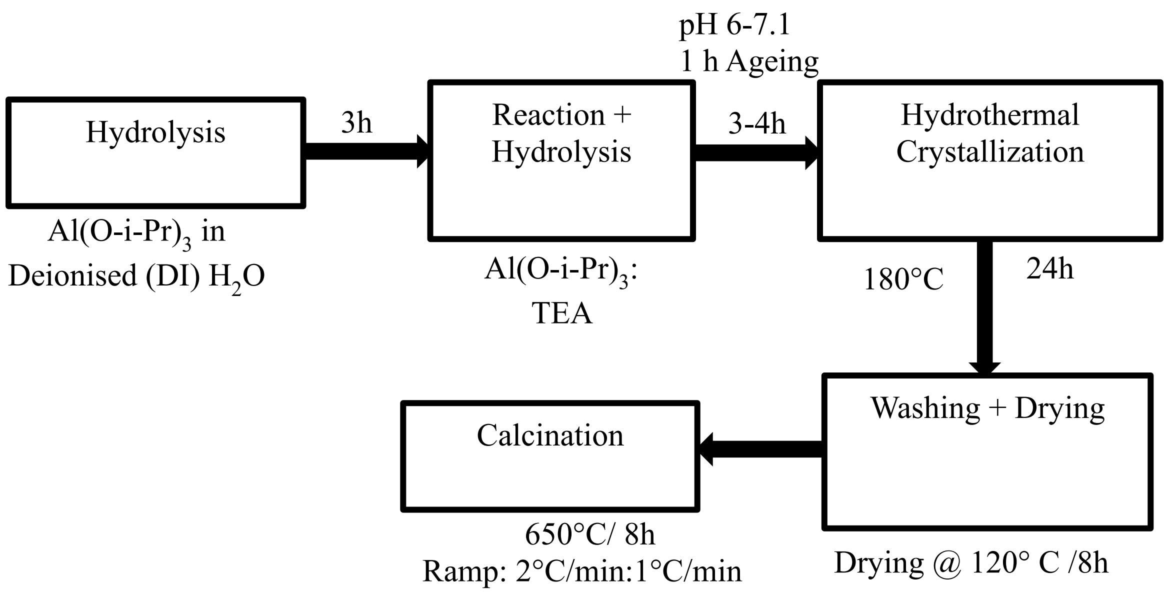


Figure 3. Summary of synthesis procedures for basic AlPO4-5

However, before this set of procedures, I used several sets of procedures with changes to the order of steps and/ or synthesis and crystallization conditions from set to another, or completely abandoning them based on poor-quality products or no target products at all. Each set of procedures was named alphabetically going from A-J. Set I was my best set of procedures. The labels given to procedure sets also influenced the sample labels, for example, samples synthesized by procedure Set F were labeled as $F_{Al(1)}$ meaning the first basic $AlPO_4$-5 synthesized by procedure Set F; $I_{Al(2)}$ meaning the second basic

$AlPO_4$-5 synthesized under procedures Set I. For substituted $AlPO_4$-5, say Sn/AlPO-5, it would be $I_{Sn(x)}$ where x represents what position in the runs for that set of procedures that sample occupies e.g., 1, 2, 3, 4 etc. These notations and labels may not be reflected on the results provided herein but are given only to give a complete story and in any case, if they are reflected, they should not be a surprise.

In all the failed attempts to synthesize the basic material or 'would-be' perfect AlPO-5, there was always either a condition, or a set of conditions or a lack thereof that caused the synthesis to be unsuccessful. Every time the synthesis was unsuccessful as proven by XRD results, more literature was researched and a cause-and-effect analysis was completed in order to identify and eliminate the potential causes. An example of the cause-and-effect diagrams used in this type of analysis is provided in Figure 4.

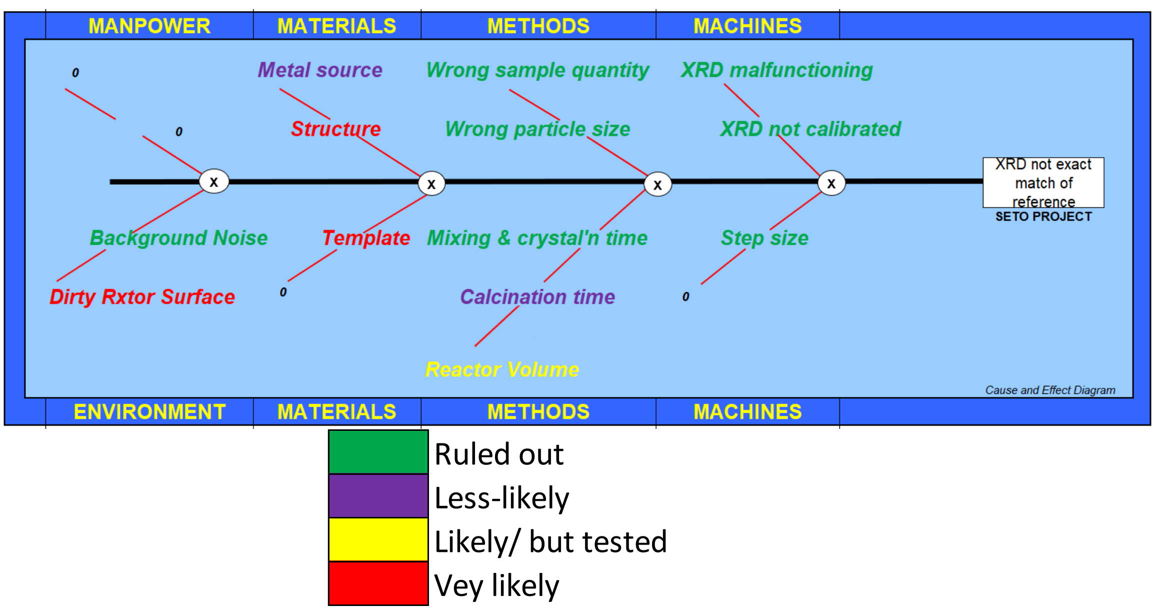


Figure 4. Example of cause-and-effect diagram used to identify causes of wrong crystal structure based on XRD results, which would then influence the changes in synthesis procedures or conditions.

Some of the major causes of the unsuccessful synthesis were; contaminated reactors. The starting reactors used were old and had been used in the synthesis of other materials. It was almost impossible to have them clean even with the use of solvents such as alcohol, bases and acids. When new reactors were ordered, there was a prolonged waiting period before these reactors arrived and that was partially a cause of the delay in getting the structure correct. Another cause of the unsuccessful synthesis was related to mixing and crystallization times. Mixing and crystallization times were just as critical. Mixing is especially true for the doped samples. Sn/AlPO-5 specifically required more forceful mixing as the gel forms only seconds after the first drop of the template reaches the reaction mixture. Initially, only stir plate/ magnetic bar mixing was used for mixing and it was soon realized that this type of mixing could not provide sufficient mixing for the unsubstituted $AlPO_4$-5 and could not provide any mixing at all for the Sn/AlPO-5.

New overhead mixers were ordered but these also took long before they were delivered; crystallization time and temperature were also major factors. While some literature suggested crystallization temperatures such as 140^0C, 150^0C and 160^0C and crystallization times as low as 5 - 8 hours, these conditions were not helpful with samples in this project. It was later discovered that $AlPO_4$-5 synthesis could be seeded and most of these literatures that reported crystallizations at low temperatures such as 140^0C, 150^0C, and 160^0C perhaps reported conditions after they had previously synthesized $AlPO_4$-5 in their reactors. In my reactors for example, where I have synthesized substituted $AlPO_4$-5 at 180^0C for 48 hours, it is now possible to synthesize substituted $AlPO_4$-5 at lower crystallization temperatures and crystallization times because of seeding. However much the reactors are cleaned, the internal wall surfaces of the reactors have now been affected by previous synthesis that they can now affect, seed, or simply influence the synthesis of any $AlPO_4$-5 at slightly different temperatures and crystallization time.

After several failed synthesis attempts, I switched the template from TMG to a more commonly used template, TEA. Any purchases of TEA and other chemicals along the way slowed down the work due to limited or delayed deliveries related to Covid 19. Other causes of delays were equipment breakdown, for example, the TGA which was the first alternative for investigating template removal from the samples and gas adsorption, broke down and took several weeks – months before the supplier could fix it. The XRD at the Eyring labs broke down and took several weeks before repair, therefore, I could not validate my procedures by comparing XRD patterns of synthesized materials and those in published literature. Other equipment such as the 3-Flex for measuring gas adsorption had been out of function by the time this work started. Wait times for maintenance were longer than anticipated, sometimes up to several weeks or even months;- required several coordination with the suppliers. One of the most important causes of the delayed success though was the lack of understanding for the specific details for material synthesis through hydrothermal crystallization. These details are not commonly reflected in synthesis procedures of materials published in literature, but rather I learned them through failure in the process and also by talking to experts in material synthesis. These details are, for example, to not fill the reactor to more than 2/3 of the reactor volume or mix materials a certain way.

The final synthesis procedures for $AlPO_4$-5 as summarized in Figure 3 are explained as follows; $AlPO_4$-5 was synthesized according to typical procedures in literature by Cheng and colleagues [11] but with minimal changes in steps. 29.43 g of aluminum isopropoxide were hydrolyzed in 100 ml of deionized water for about 3.5 hours on an overhead mixer. 10.17 ml of phosphoric acid were then added drop-wise and the resulting mixture was stirred for 30 mins. 10.43 ml of TEA were then added dropwise and the solution was mixed for 1 hour. The resultant gel was then transferred to a Teflon-lined autoclave reactor and crystallized at 180^0C for 24 hours. The supernatant solution was then removed by centrifuging and samples were washed copious times before drying them at 120^0C for 8 hours in a forced air convection oven.

It is worth noting and emphasizing that in some of the procedure sets (abandoned) from A-J, I removed supernatants by filtration, crystallized at lower temperatures than 180^0C and in other cases, crystallized at higher temperatures. In other cases (procedure sets abandoned), crystallization time was between 8-16 hours while in others, it was between 36 and 48 hours. For all crystallization at any temperature less than 180^0C, and or time less than 24 hours, the resulting products were amorphous, or sometimes crystalline but with multi-phases as seen in Figure 7. Products of the basic $AlPO_4$-5 from crystallization times longer than 24 hours did not yield any better crystallinity than those from crystallization at 24 hours. This explains why I made alterations to procedures and maintained the crystallization temperature at 180^0C and 24 hours of crystallization time. In some cases, I included a step of overnight ageing or 1-6 hours of ageing. This ageing step was ideally intended to support nucleation[16, 29-31] and faster crystal growth rate[32-37].

After samples were dried, they were calcined in a limited-air oven at 650^0C with the following ramp conditions for 8 hours; first from ambient to 600^0C at a ramp rate of 2^0C/min, hold at 600^0C for 10 mins to stabilize, then increase the temperature by 1^0C/min to 650^0C. At this stage, the samples were ready for characterization and sorption experiments. It is worth noting, though, that in some of the abandoned procedure sets, I calcined samples at 550^0C, but these samples had a significant amount of un-removed template observed by the dirtier yellowish color of the samples except when calcined for about 24 hours. In other cases where I had lower temperatures or less calcination time, the samples turned black and when the temperature and time were increased again, the samples would turn white. Figure 5 summarizes the procedures followed in the synthesis of single-metal substituted $AlPO_4$-5 such as Sn/AlPO-5, and Mo/AlPO-5, etc.

1.3.Experimental Procedures for the Synthesis of Substituted $AlPO_4$-5

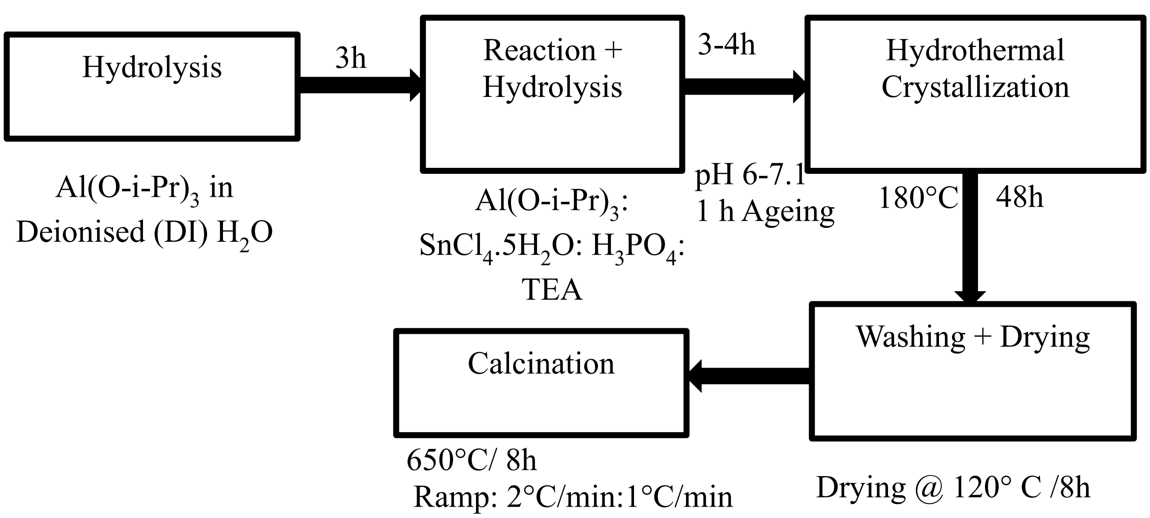


Figure 5. A Summary of the synthesis procedures of substituted $AlPO_4$-5.

The Sn salt given under the “Reaction + Hydrolysis” step is an example of the salts used as the dopant cation (metal) source listed in Table 1. These procedures are similar to those of the basic $AlPO_4$-5 except for the following steps; 1) the aluminum isopropoxide was hydrolyzed in 90 ml of water instead of 100 ml. 2) The Sn salt was dissolved in 10 ml of water, then added to the aluminum slurry dropwise, followed by the addition of phosphoric acid after 30 min of mixing. In another case (not abandoned), the substituting metal source was mixed with the phosphoric acid before adding it to the aluminum slurry. This was found to achieve results similar to when the metal source is separately added to the aluminum slurry, then a 30 min time lag under mixing, followed by the acid.

On the other hand, among some of the abandoned procedure sets, the aluminum slurry and the phosphoric acid were mixed, then a time lag, and then the substituting-metal source. In other cases (abandoned), the substituting-metal source was the last thing to add after the addition of the template (TEA) with a 10-30 min lag window after TEA has been added. In both of these last two procedure sets (abandoned), the zeolites were not good oxygen adsorbents and, therefore, were abandoned. Exception 3 is that the preferred crystallization time for substituted $AlPO_4$-5 was 48 hours as opposed to 24 hours in the basic $AlPO_4$-5 synthesis procedures. Substituted materials crystallized for 48 hours were better in crystallinity than those crystallized for 24 hours.

To synthesize the multi-metal substituted $AlPO_4$-5, i.e., MnSnSi/AlPO-5, the following procedures were followed. It is vital noting that my intention, in this case, was to increase the network/framework volume of the material with a relatively lower increase in overall material mass. Achieving this required consideration of the atomic radius of each transition metal atom selected, but also their weight among those predicted to have oxygen adsorption capability [5]. The procedures were designed with reference to published literature on the design of substituted $AlPO_4$-5[11, 17, 18, 38-41]. To start with, 29.43 g of aluminum isopropoxide were hydrolyzed in 90 ml of deionized water for 3.5 hours on an overhead mixer. In a different setup, 0.851 g of manganese (II) chloride tetrahydrate, 0.892 g of tin (IV) chloride pentahydrate and 965 microliters of tetraethyl orthosilicate were dissolved in 10 ml of deionized water and then the solution was transferred drop-wise to the aluminum slurry.

The mixture was further stirred for 1 hour, and then 16.33 ml of phosphoric acid were added drop-wise. The mixture was further stirred for 1 hour. A total of 28 ml of TEA were added to the gel dropwise in small amounts intermittently; first, 20 ml of TEA were added drop-wise and contents mixed for five minutes to hydrolyze the template. The pH at this stage was 5.6. Another 3 ml of TEA were added drop-wise and hydrolyzed for about the same amount of time before measuring the pH as 6.1. After stirring for another about 5-10 mins, another 2 ml of TEA were added drop-wise and the pH measured was 6.4. 1 mL of TEA was added drop-wise and the subsequent pH measurement was 6.6 followed by addition of 2 ml TEA and the final pH was 6.7. The resultant gel was then further mixed for slightly over 1 hour and then left to age for 1 hour. The gel was then transferred into a Teflon-lined autoclave reactor for hydrothermal crystallization at 180°C for 48 hours in a forced-air convection oven. Sample handling after this stage was similar to that of the basic $AlPO_4$-5.

It is worth noting that the synthesis and post-synthesis procedures continuously went through improvement or changes even after several successful batches had been synthesized in order to improve the properties of the zeolites. Needed steps/ course of action to improve the zeolites were often developed through a thoughtful process by using a combination of the cause-and-effect diagram and sketches that represent the synthesis and post-synthesis steps. An example of these sketches is given in Figure 6.

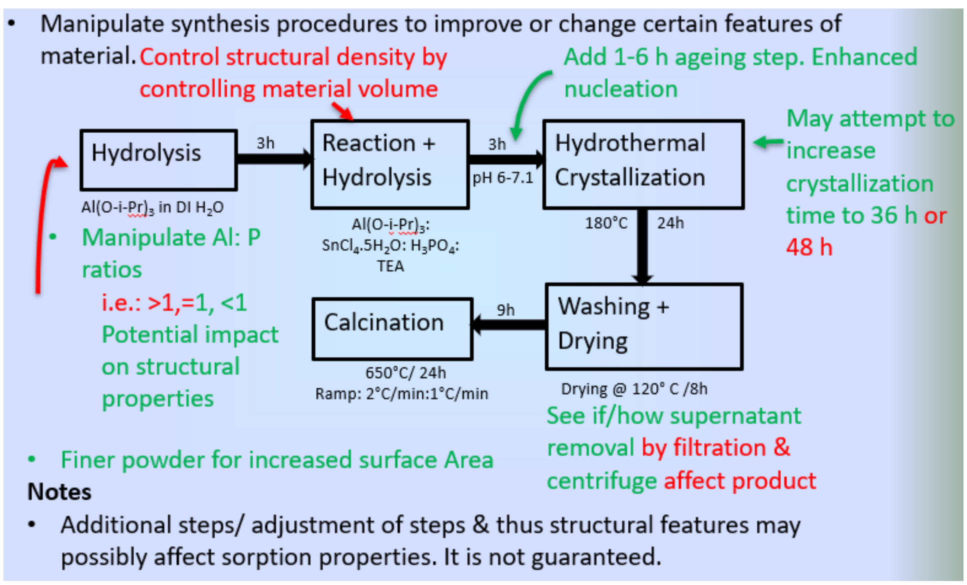


Figure 6. Illustration of the thought process in identifying where exactly in the synthesis, a change could be applied based off of results from the cause-and-effect diagram.

Possible causes of low oxygen adsorption, material crystallinity (or something else), were screened using the cause-and-effect diagram such as one in Figure 4, then a sketch like the one in Figure 6 was used to identify at exactly what step in the synthesis or post-synthesis, a change could be applied.

2.Characterization

Before any samples were characterized, they were ground into a fine powder and sieved. Not all samples were characterized by all techniques used. Characterization of some samples by a given technique was a choice based on need, resources, and time constraints. The characterization techniques used in this work include; XRD for crystal structure and phase identification, nitrogen adsorption for specific surface area and pore size distribution, XPS for elemental analysis, SEM for morphology and particle size estimation, and EPR for the nature of adsorbed oxygen.

2.1.Structure and Phase Identification

XRD patterns of select samples were obtained using an Aeris Powder X-ray Diffractometer to confirm the crystal structures of the zeolites and identify any additional phases in the synthesized materials. A continuous scan type was used at a scan step of 0.087 and scan range of 2θ between 5^0 and 80^0. Figure 7 and Figure 8 are examples of the XRD patterns obtained from the failed attempts in the initial stages of the project for the basic $AlPO_4$-5 and Sn/AlPO-5 respectively.

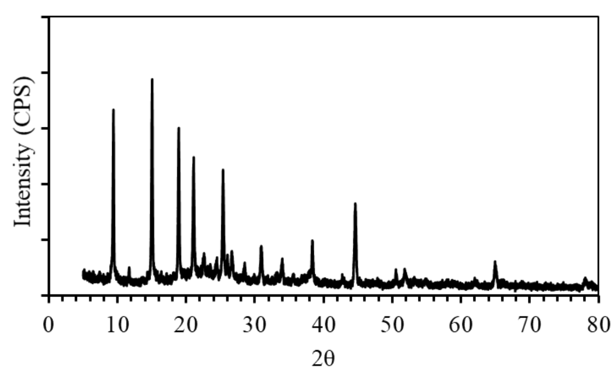


Figure 7. Example XRD pattern of $AlPO_4$-5 from the failed synthesis attempts.

It is to be noted that the results in Figure 7 and Figure 8 are only provided for the purpose of narrating a complete story. It can be seen, however, that there are many extra peaks in Figure 7 as compared to the correct XRD patterns shown in Figure 9 that agree with published literature[42, 43]. Figure 8 shows none of the known standard peaks for Sn/AlPO-5 as expected in published literature[12, 44, 45] and as seen in Figure 9.

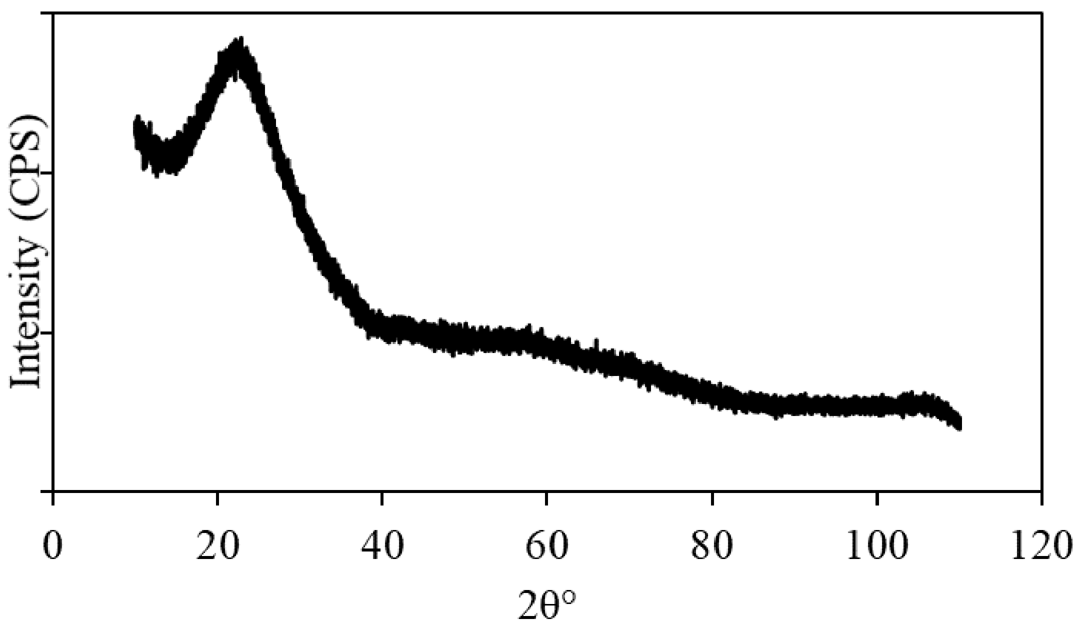


Figure 8. Example XRD pattern of Sn/AlPO-5 from a failed attempt at synthesis.

Figure 9 shows XRD patterns of some calcined zeolite samples at final stages in the project. After testing a handful of synthesized materials that showed successful products from the best synthesis procedures, most of the remainder of the materials were often only tested when in doubt but mostly they were assumed to exhibit similar XRD patterns when the synthesis procedures were maintained. All the materials showed expected AFI prominent peaks. MnSnSi/AlPO-5 has an additional peak at about 2θ =9.8^0.

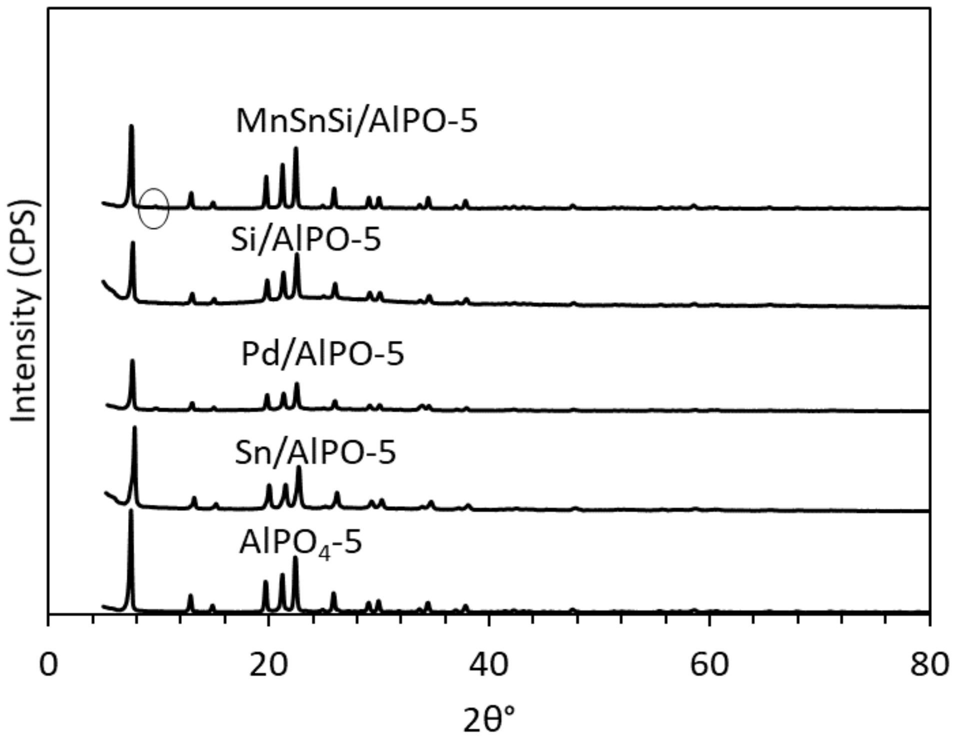


Figure 9. XRD patterns of some of the calcined samples; basic AlPO$_4$-5, Sn/AlPO-5, Pd/AlPO-5, Si/AlPO-5, and MnSnSi/AlPO-5.

The peak is exceedingly small and could be easily treated as some sort of noise or even unnoticed. It is common for such peaks to be easily attributed to background noise and ignored while focusing on the major AFI peaks. However, the peak is reported here because it appeared in more than one synthesized sample of MnSnSi/AlPO-5 and perhaps it could reflect in-depth structural features in this material that influenced its oxygen adsorption behavior. Additional investigations are necessary to fully identify that peak even though with limited data, it is currently attributed to a variant in the oxides of Mn of a different oxidation state than Mn(II).

2.2. Surface Area and Pore Size Distribution

Using nitrogen adsorption at 77K in a 3Flex adsorption apparatus (Micrometrics), the surface areas of some of the materials and the pore-size distributions were determined. Samples were degassed at 400^0C for at least 24 hours on a vacuum unit and then let to cool down while still on the vacuum for about 1-2 hours before the analysis. It is important to note that early on in the project, degassing was done at 300^0C. The degassing temperature was changed to 350^0C, then to 400^0C to investigate whether this would improve gas adsorption in the materials. The Brunauer-Emmett-Teller (BET) method was used for calculating the specific surface area of the zeolite samples and the Horvath-Kawozoe (HK) method was used for determining the pore size distribution. Results shown herein are representative of those tested but also because of similar synthesis conditions, and in the interest of time and resources, it was assumed that all other single-metal substituted $AlPO_4$-5 whose surface areas were not measured would show similar textural properties to those that were measured for which Sn/AlPO-5 is representative.

For the purpose of showing that the synthesis process went through a series of changes and phases even after successfully obtaining the correct structure confirmed by XRD patterns, nitrogen uptake in the basic $AlPO_4$-5 and Sn/AlPO-5 samples synthesized in the early stages of the project are shown in Figure 10 and Figure 11 respectively. Initial $AlPO_4$-5 exhibited a characteristic nitrogen uptake of a combination of Type II and Type IV. It also had a hysteresis loop characteristic of a combination of both H4 at the lower relative pressures of the loop and H3 (because of the plateau) at the higher relative pressures. Initial successfully synthesized $AlPO_4$-5 samples also had smaller surface areas, but gradually, the surface areas of the materials were improved by using the cause-and-effect diagrams for example that shown in Figure 4, but of course with other cause parameters. The BET specific surface area for the sample whose results are shown in Figure 10, for example, was 135.8 m^2/g which is low compared to the 273 m^2/g of the latter $AlPO_4$-5 in Table 2.

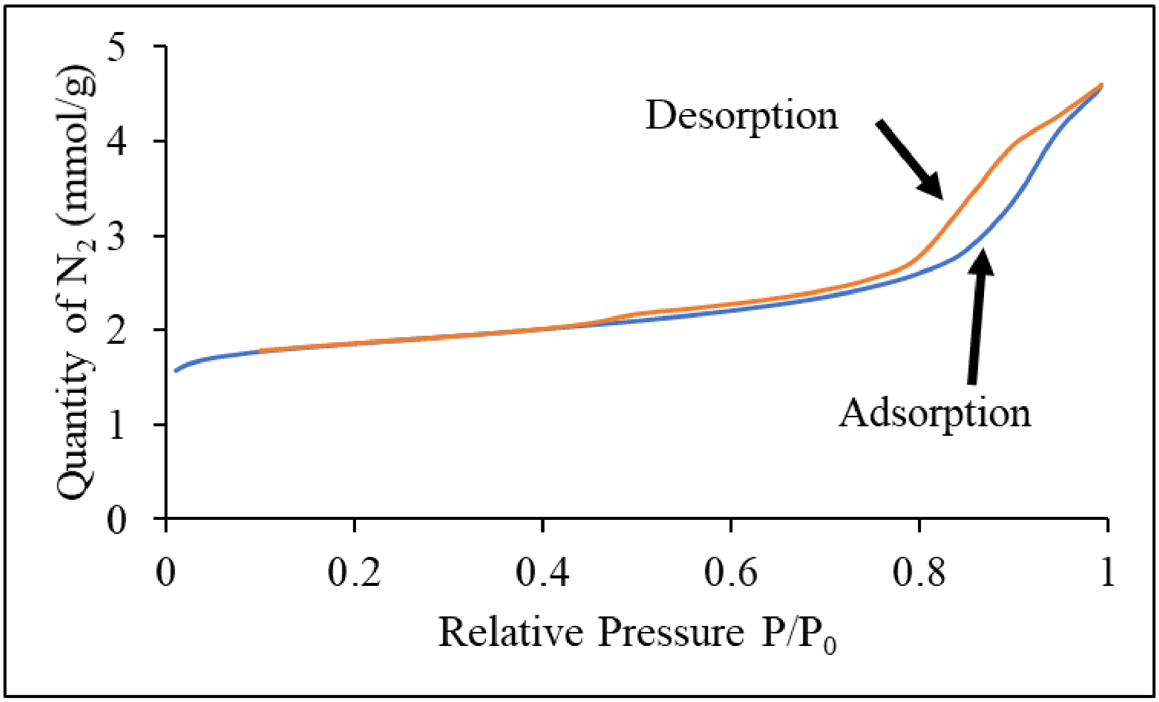


Figure 10. Example nitrogen adsorption-desorption isotherms of $AlPO_4$-5 in the early stages of the project.

For the Sn/AlPO-5 sample whose results are shown in Figure 11, the ratio of Sn/Al was 1:2. However, latter synthesis experiments had ratios of Sn/Al of 1:11 or 1:10 as desired by the rest of team. When Sn/Al ratio was 1:2, the nitrogen uptake isotherm for Sn/AlPO-5 was typical Type IV with the finite limit as $P \rightarrow P_0$ [46] and an H4-like hysteresis loop. This should not be interpreted as though the change in Sn/Al ratio had an influence on the nitrogen uptake. That would require further investigation to ascertain. Earlier on in the synthesis, the BET specific surface of the Sn/AlPO-5 zeolite samples were low. However, they were gradually improved with similar approach as that previously mentioned for the basic $AlPO_4$-5. For example, for the sample whose nitrogen adsorption-desorption isotherms are shown in Figure 11, the BET specific surface area was 152.4 m^2/g, which is lower than the 257 m^2/g for latter samples as shown in Table 2.

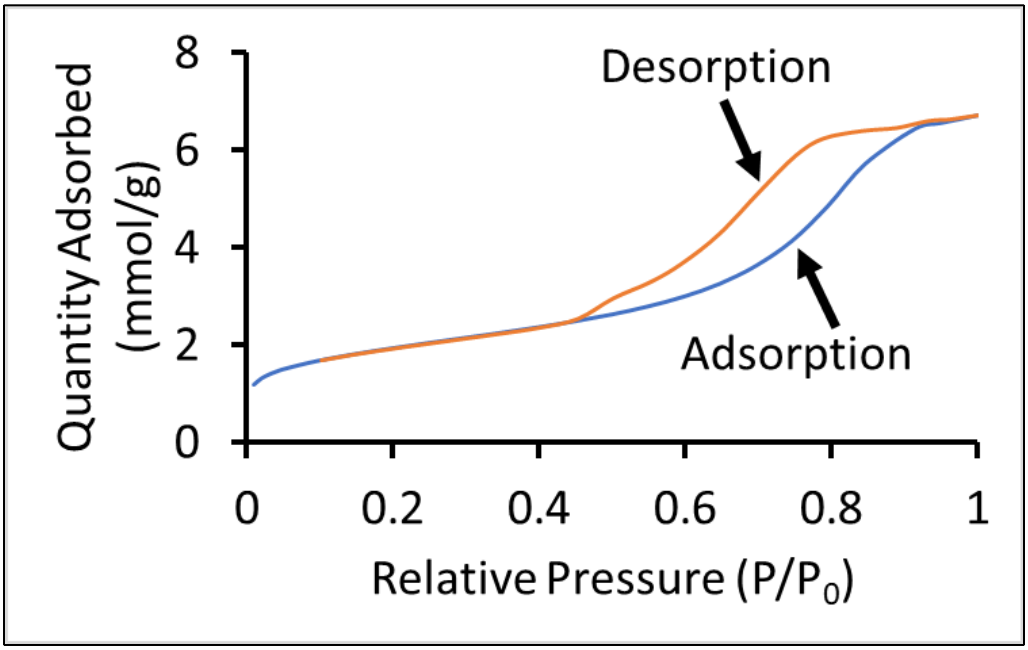


Figure 11. Example nitrogen adsorption-desorption isotherms for Sn/AlPO-5 in the early stages of the project. Ratio of Sn/Al is 1:2.

Figure 12 shows the nitrogen adsorption and desorption isotherms at 77K in the basic $AlPO_4$-5, Sn/AlPO-5 - that is also representative of other single-metal substituted $AlPO_4$-5, - and MnSnSi/AlPO-5 in the latter/final stages of the project. The basic $AlPO_4$-5 and MnSnSi/AlPO-5 structures show typical Type I nitrogen uptake which is typical for microporous materials(46, 47). The basic $AlPO_4$-5 and MnSnSi/AlPO-5 have slit-like pores and parallel walls. This is because their hysteresis loops which are barely noticeable are very flat and parallel[46-50], typical for H2 hysteresis. Sn/AlPO-5, however, shows a typical Type II nitrogen uptake and a hysteresis loop of H1 type in that the adsorption and desorption branches are vertical and parallel. This type of hysteresis signifies the presence of pores that are tubular in shape and open at both ends [46].

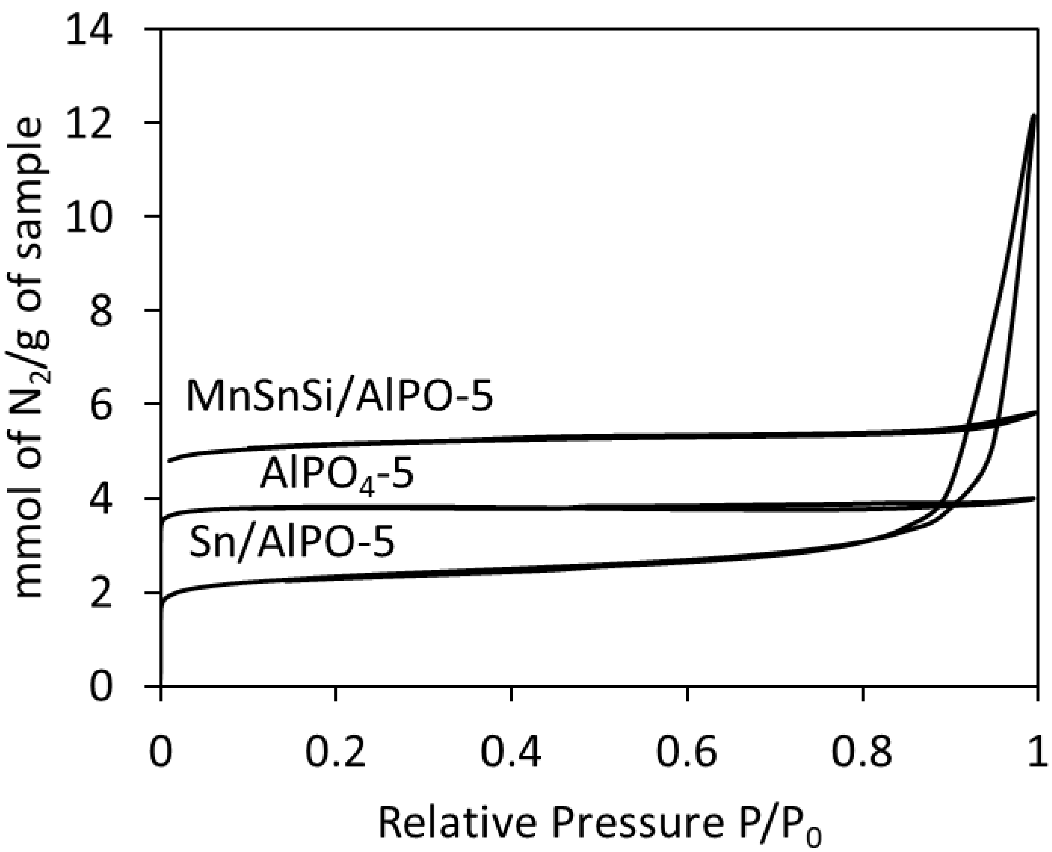


Figure 12. Nitrogen adsorption and desorption isotherms of the basic $AlPO_4$-5, Sn/AlPO-5(Sn/Al =1:11), and MnSnSi/AlPO-5 at 77K.

The difference in nitrogen uptake curves of Sn/AlPO-5 from the rest is probably due to the slight change in synthesis conditions (pH) caused by the acidic nature of the tin chloride salts used in making the precursor gel.

Figure 13 shows the pore size distribution of the basic $AlPO_4$-5, Sn/AlPO-5, and MnSnSi/AlPO-5 in the final stages of the project.

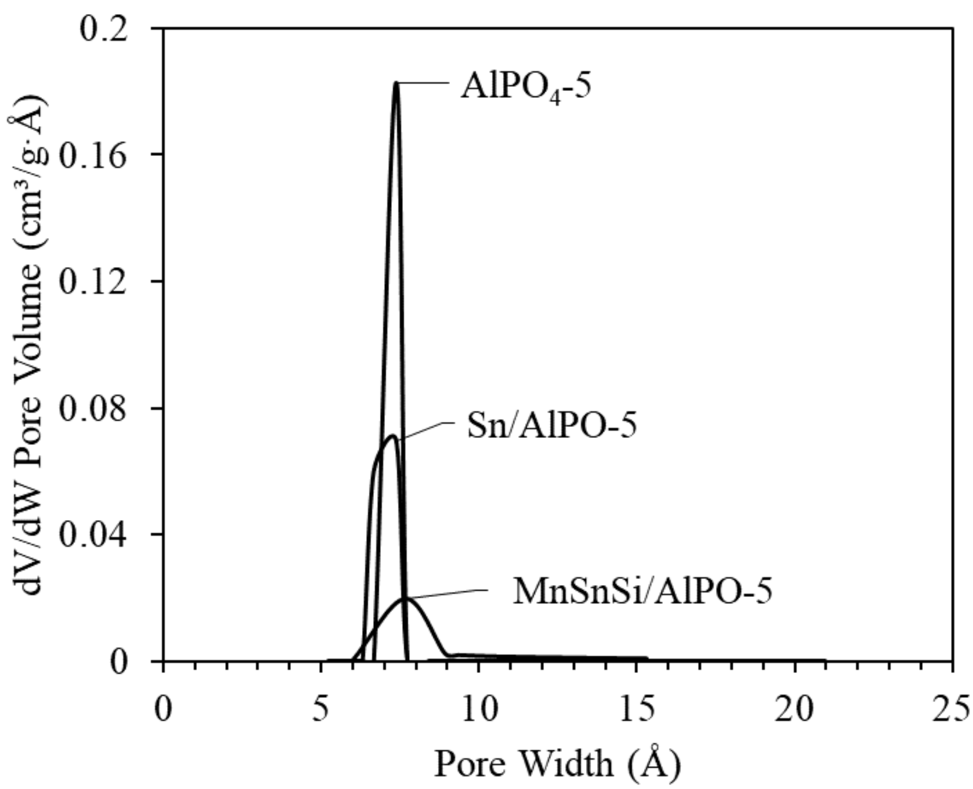


Figure 13. Pore size distribution of the basic $AlPO_4$-5, Sn/AlPO-5, and MnSnSi/AlPO-5.

All materials synthesized exhibited pore sizes between 6Å and 9Å for most pores, indicating that these materials were microporous. MnSnSi/AlPO-5 had a wider pore size distribution as compared to the rest of the materials synthesized. This is attributed to the varying atomic sizes of the substituting atoms. The atoms used, Mn, Sn, and Si have different atomic radii which means that depending on the bonds formed in the network enclosing a given pore in the framework, the pore size will vary accordingly. And since the substitution/doping is not uniform throughout the material as discussed later in the O_2 adsorption section, a reasonable pore size distribution is expected.

Other textural properties obtained using the nitrogen adsorption technique are listed in Table 2.

Table 2. BET surface area, micropore volume, and average pore size of $AlPO_4$-5, Sn/AlPO-5, and MnSnSi/AlPO-5

	BET Surface Area (m^2/g)	t-Plot Micropore Volume (cm^3/g)	Average Pore Size (Å)
$AlPO_4$-5	273	0.128	~7
Sn/AlPO-5	257	0.065	~7
MnSnSi/AlPO-5	307	0.160	~8

The BET surface area of the MnSnSi/AlPO-5 was significantly higher than the other two reported and this is attributed to the strategic increase in network volume of the material with a relatively lower increase in the overall mass of the material. The increase in network volume has a direct effect on the micropore volume and thus free-space volume used in the calculation of BET surface area.

2.3. Elemental Analysis of the Zeolite Samples

The only materials characterized with XPS were Sn/AlPO-5, Mo/AlPO-5, and MnSnSi/AlPO-5, due to limited resources. XPS spectra of Sn/AlPO-5, Mo/AlPO-5, and MnSnSi/AlPO-5 are shown in Figure 14. Sn/AlPO-5 and Mo/AlPO-5 exhibit peaks for all dopants used as seen in Figure 14 a and Figure 14 b respectively. However, MnSnSi/AlPO-5 exhibits no peaks for the dopants as seen in Figure 14 c. This lack thereof is attributed to the low molar amounts of the dopants to below detectability in XPS. For further illustration, the following represents the relative dopant amounts. Sn : Al in Sn/AlPO-5 = Mo : Al in Mo/AlPO-5 = (MnSnSi) : Al in MnSnSi/AlPO-5.

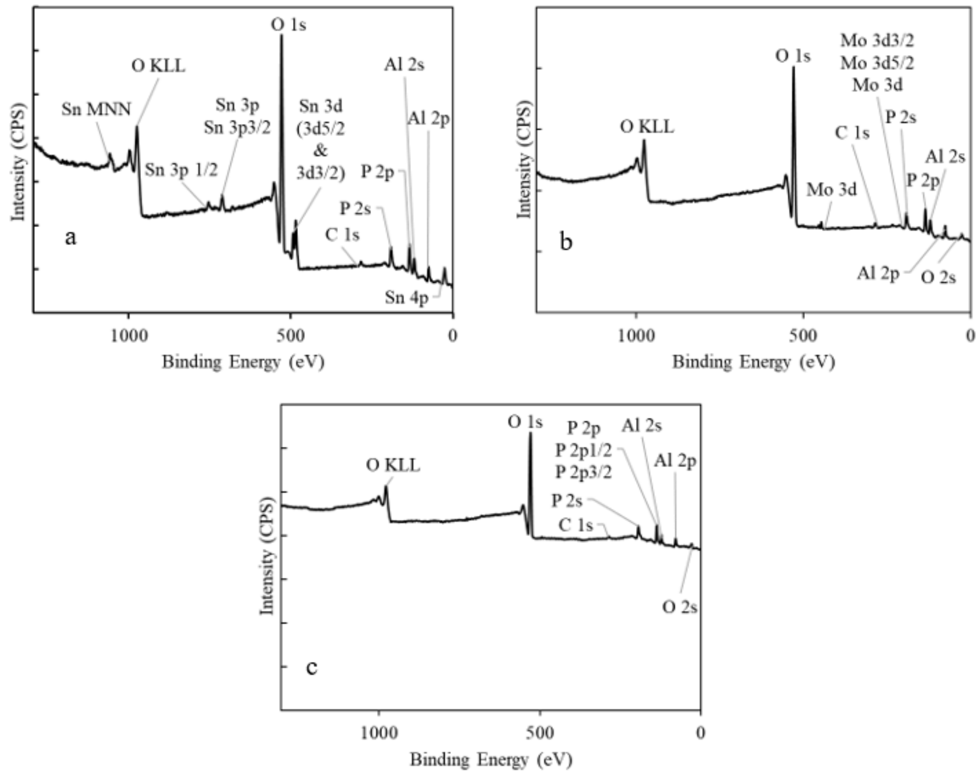


Figure 14. X-ray spectroscopy of (a) Sn/AlPO-5, (b) Mo/AlPO-5, and (c) MnSnSi/AlPO-5.

By these results, it is evident that the synthesized materials were successfully doped. Increasing the dopant molar amount in the MnSnSi/AlPO-5 would most likely result in visible XPS peaks at binding energies corresponding to Mn, Sn, and Si respectively.

Furthermore, four samples were evaluated with XPS to identify if there were differences between the elemental composition of samples that exhibited high oxygen adsorption and those that exhibited low oxygen adsorption or those that had not been used for oxygen adsorption yet as seen in Figure 15 and Figure 16. The four samples were; one used sample of Sn/AlPO-5, one fresh sample of Sn/AlPO-5, one used sample of Mo/AlPO-5 that had previously exhibited high adsorption and one sample of Mo/AlPO-5 that had exhibited low adsorption. 'High' and 'low' used in this context are referring to the maximum oxygen uptake observed and average oxygen uptake observed respectively as discussed in the Oxygen Adsorption section.

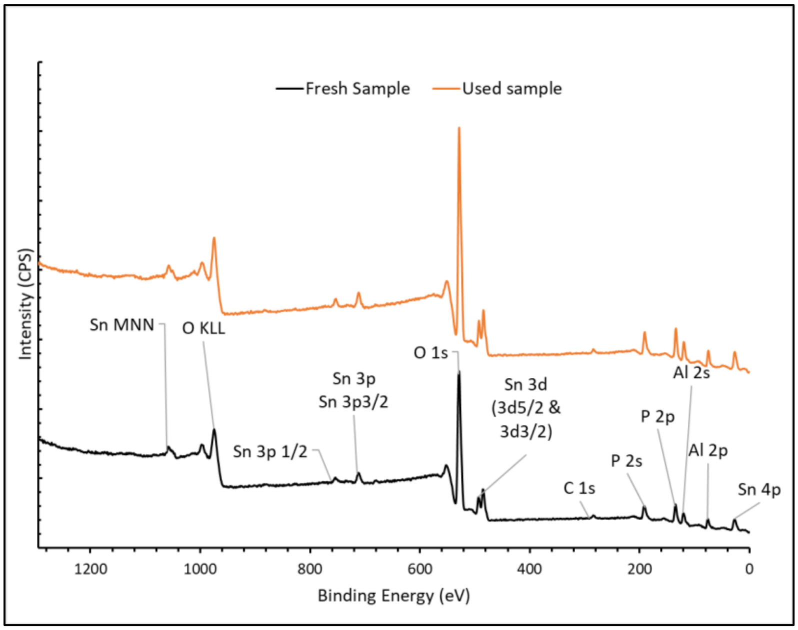


Figure 15. XPS spectra of a fresh Sn/AlPO-5 sample and used Sn/AlPO-5 sample.

There was no difference in the observed XPS spectra for both the fresh Sn/AlPO-5 zeolite sample and the used Sn/AlPO-5 sample. It is important to note that the samples under investigation (Sn/AlPO-5 in Figure 15 and Mo/AlPO-5 in Figure 16) were fully crystalline samples confirmed with XRD and the Sn/AlPO-5 BET specific surface areas had been already determined using nitrogen adsorption and confirmed to results in Table 2. The fresh sample contained a higher atomic percentage (At.%) of Sn than the used sample by 0.13% as seen in Table 3. There was no physical significance of this at the moment.

Table 3. Elemental composition of a fresh and a used Sn/AlPO-5 determined by XPS

Fresh Sn/AlPO-5 surface At.%		Used sample surface At.%	
Element	At.%	Element	At.%
Sn 3d	2.4	Sn 3d	2.27
Al 2p	15.59	Al 2p	18.08
P 2p	15.87	P 2p	17.06
O 1s	63.66	O 1s	60.32
C 1s	2.48	C 1s	2.27

The intention for obtaining this data was to observe and test the hypothesis that a used sample that exhibited high oxygen adsorption could have a different amount of Sn than a fresh sample. This is explained further with Mo/AlPO-5 in Figure 16. XPS is a surface characterization technique, and therefore, it is expected that the data obtained was just from a few nanometers underneath the surface of the zeolites. This means that the data did not reveal any information to do with dopant distribution (Sn or Mo) from the interior to the rim of the crystals. What it does reveal, though, is that on the surface of these crystals, the dopants are not uniformly distributed. We can see this from the fact that the data obtained from one point in one sample of Sn/AlPO-5 showed 2.4 At.% while another point in another sample showed 2.27 At.%. Both of these samples were from the same batch even though one sample had been used for oxygen adsorption and the other was fresh. If the surface of the crystals had a uniform distribution of the dopants, the At.% of Sn in one sample would be equal to that in the other sample at any point in the crystals, from which data is drawn. This was not the case in the results obtained. If the surface of the crystals do not have a uniform distribution of the dopants, it is likely that the interior of the crystals are the same.

Figure 16 shows XPS spectra of two used Mo/AlPO-5 samples that exhibited different oxygen uptake amounts.

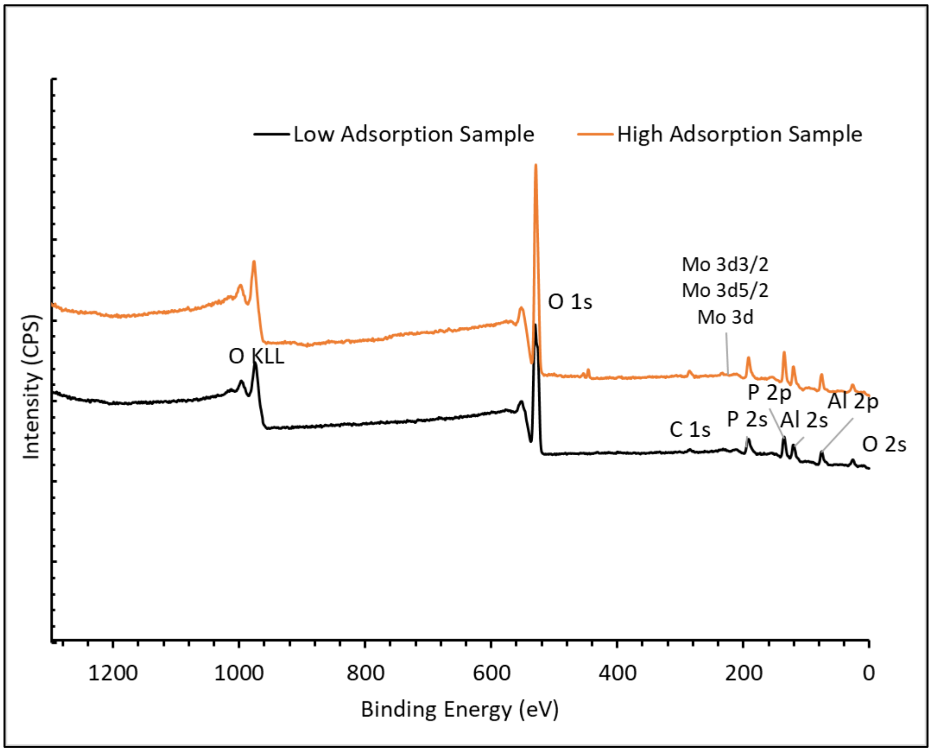


Figure 16. XPS spectra of an Mo/AlPO-5 sample which exhibited high oxygen adsorption and Mo/AlPO-5 which exhibited low oxygen adsorption.

Similar to the Sn/AlPO-5 samples, there was no difference between the spectra of the sample that had shown high oxygen adsorption and that that had shown low oxygen adsorption. Table 4 obtained by XPS shows the elemental composition of both Mo/AlPO-5 samples. The low adsorption sample did not show any presence of Mo, while the high adsorption sample exhibited only 0.02 At.%. This confirms two things; first, the dopant distribution in the zeolites is not uniform, at least on the surface, since there is no interior data. It has been stated already, though, that if the surface dopant distribution is not uniform, the interior dopant distribution is likely not uniform either.

Table 4. Elemental composition of a high adsorbing Mo/AlPO-5 and a low adsorbing Mo/AlPO-5

High adsorption Mo/AlPO-5 surface At%		Low adsorption Mo/AlPO-5 surface At%	
Element	At.%	Element	At.%
Mo 3d	0.02	Mo 3d	-
Al 2p	18.66	Al 2p	24.41
P 2p	16.88	P 2p	14.75
O 1s	59.91	O 1s	59.19
C 1s	4.53	C 1s	1.65

The second confirmation is that higher oxygen adsorption in some specimens is due to the cumulative effect of the dopant distribution. If a specimen is drawn from a given sample batch and tested of oxygen adsorption, the overall amount of oxygen that specimen would adsorb is related to the cumulative concentration of the dopant in the material. This means that two specimens drawn from a given sample batch can show different oxygen adsorption properties as observed later herein.

Even though the Sn/Al and Mo/Al ratios in Sn/AlPO-5 and Mo/AlPO-5 were the same i.e., 1:11, the atomic percentages of each dopant in the respective zeolites were different. This is because XPS is a surface characterization technique and, therefore, the data provided does not represent overall quantities of the various atoms in the zeolites and it has already been suggested that the surface distribution of these dopants in the respective zeolite materials is not uniform. At this point, it is difficult to compare Sn/AlPO-5 samples and Mo/AlPO-5 samples based off of these data without further investigation. A more relevant technique that would be useful for the comparison of the two materials is Inductively Coupled Plasma (ICP) which was initially ignored because it could not measure the oxygen atoms and would not favor MnSnSi/AlPO-5 because of the presence of Silicon.

2.4. Morphology and Crystal Size

Morphology of the synthesized crystals and crystal size were observed using SEM imaging technique with backscattered electron imaging (BSE) on the XL 30 Environmental FEG-FEI. It is worth noting that either due to less expertise in SEM imaging or just the nature of the instrument, multiple SEM imaging trials on a Focused Ion Beam (FIB)-Helios5 UX- TFS (Helios5) had been previously completed before trying the XL 30 and had yielded no good images as seen in Figure 19. Images obtained on the Helios5 were largely affected by sample charging even when samples were sputter-coated with a conductive layer and could not convey any useful information. In reality, the FIB Helios5 should be a better and more modern instrument than the XL 30. However, the XL 30 environmental unit which reached its end-of-life cycle about a month later, seemed to do very well with non-conducting samples. And since many failed imaging runs had been completed on the Helios5, in the best interest of resource-saving, only MnSnSi/AlPO-5 were successfully imaged before the unit was shut down at the end of its life cycle and after oxygen adsorption experiments had shown MnSnSi/AlPO-5 as the best material in the latter stages of the project.

Again, for the purpose of showing a complete story and illustrating the gradual improvement in the zeolite materials throughout the process, SEM images and EDS charts for a Sn/AlPO-5 sample from a failed synthesis attempt are shown in Figure 17 and Figure 18 respectively. These SEM and EDS results were obtained before later confirming by XRD that the zeolite sample synthesized was amorphous.

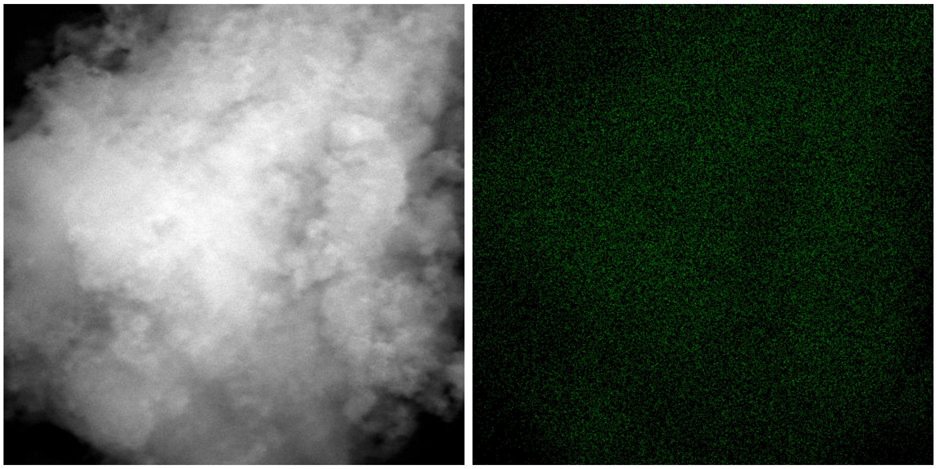


Figure 17. SEM images of Sn/AlPO-5 from a failed synthesis attempt.

It is important to note that at the time the SEM images were taken, the XRD had been out of service for some time. Therefore, our desired order of characterization for resource saving was not followed. The SEM images were taken using secondary electrons (SE) earlier in the process.

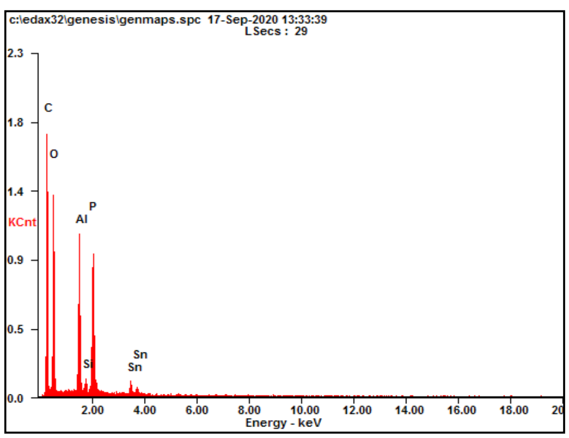


Figure 18. EDS elemental analysis of Sn/AlPO-5 from a failed synthesis attempt.

The material was amorphous even though EDS results show that all expected elements were present and in about the expected atomic percentages as seen in Figure 18. Figure 18 and Table 5 show a presence of carbon in high amounts. This was mostly due to the incomplete removal of the template in the calcination stage. The calcination at the time was about 8 hours or less. The results in Table 5 also indicate a presence of a small percentage of Si. This was probably a contaminant from the synthesis procedures or chemicals. Information like this earlier on in the process was very instrumental in improving the synthesis procedures and ultimately successfully obtaining the correct structure of the material.

Table 5. Elemental analysis of Sn/AlPO-5 from a failed synthesis attempt from earlier in the process

Element	Wt.%	At.%
C K	57.44	67.79
O K	30.17	26.73
Al K	04.99	02.62
Si K	00.33	00.17
P K	05.43	02.49
Sn L	01.64	00.20
Matrix	Correction	ZAF

The zeolite synthesis was continuously modified as explained previously herein until the correct structure was obtained and confirmed with XRD. Figure 19 shows an SEM image of Sn/AlPO-5 from latter stages in the project that were taken on the Helios5 instrument.

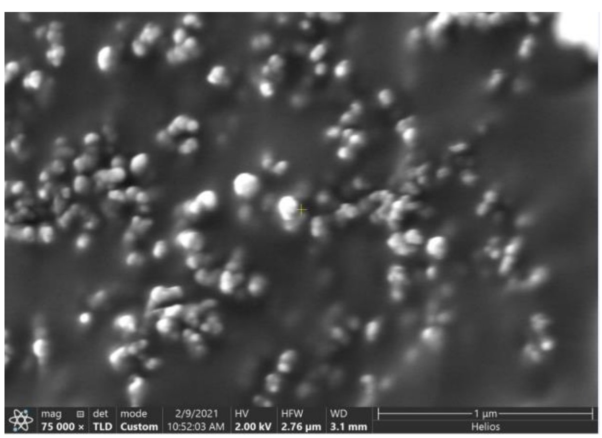


Figure 19. SEM image of Sn/AlPO-5 from a successful synthesis, taken on a Helios5.

The sample in Figure 19 was a fully crystallized Sn/AlPO-5 zeolite that had previously confirmed the AFI structure from XRD patterns. The SEM images obtained were highly affected by sample charging on the Helios5. It is worth noting that all samples were sputter-coated before testing. While no useful information about the morphology of the crystals was obtained from these images, the EDS data as shown in Figure 20 and Table 6 confirmed the presence of the dopant atoms within the range of expected atomic percentages in relation to the experimental quantities used in the synthesis.

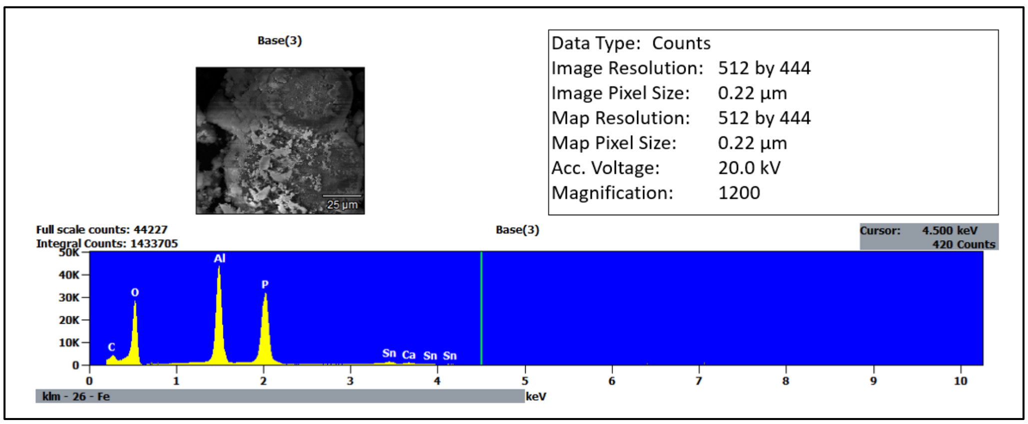


Figure 20. Elemental composition of Sn/AlPO-5 from a successful synthesis, taken on a Helios5.

The theoretical weight percent of Sn in the samples at the time was calculated to be about 2 wt.%. The results obtained on this Sn/AlPO-5 showed 2.24 wt.%. even with sample charging, this value is close to the expected value but still not very representative of the typical process due to sample charging. Figure 20 shows the EDS peaks of the material.

The high amount of carbon, observed in Table 5 resulted in further investigation of alternative approaches to calcination in order to reduce the amount of carbon in the zeolite samples. It was not expected that all the carbon observed was due to incomplete removal of the template. However, calcination of some of the subsequent zeolite samples was run under flowing air to ensure reasonable removal of the template. Latter samples were calcined in limited air but for longer calcination times.

Table 6. Elemental composition of Sn/AlPO-5 from a successful synthesis, taken on a Helios5

Element	Extracted spectrum intensity	Extracted spectrum net counts	Expected spectrum weight %	Expected spectrum atom %
C K	3.11	25651	11.51	18.00
O K	22.25	183735	48.67	57.14
Al K	43.99	363290	19.43	13.53
P K	40.13	331410	17.98	10.91
P L	0.00	0	-	-
Ca K	0.29	2355	0.17	0.08
Ca L	0.00	0	-	-
Sn L	2.11	17459	2.24	0.35
Sn M	1.41	11619	-	-
			100.00	100.00

Samples thereafter were run on the XL30. Figure 21 is an example of an older Sn/AlPO-5 zeolite sample, whose structure confirmed AFI by XRD, that was run on the XL30.

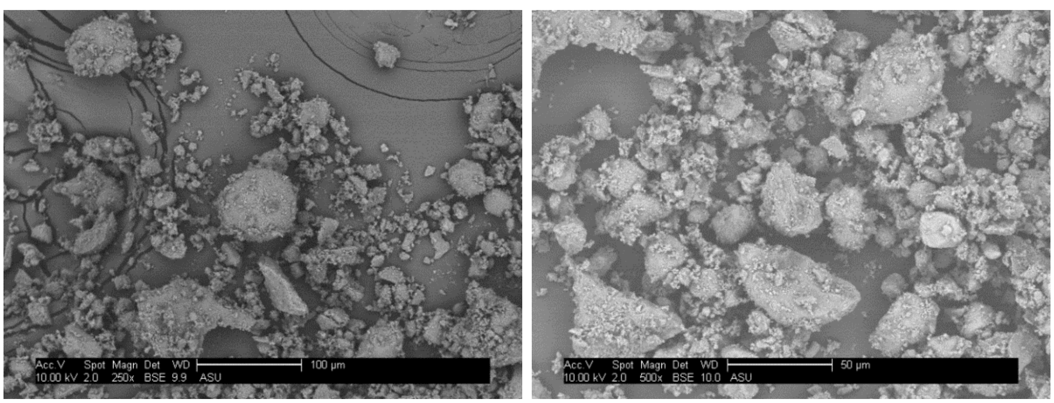


Figure 21. SEM images of an older Sn/AlPO-5 sample on XL 30.

The zeolite crystals in Figure 21 were agglomerated. This is due to some post-crystallization handling stage typically before calcination, and the low water content in the precursor gel in the earlier stages of the project. Agglomeration of the particles could be reversed by resuspending the particles in minimal cold deionized water, just enough for resuspension. It is also necessary to understand some key concepts of powder handling in order to properly mill the samples if an automatic ball mill is to be used. The sample in Figure 21 was comprised of spherical crystals some of which were agglomerated and others broken. Figure 22 shows SEM BSE images of MnSnSi/AlPO-5.

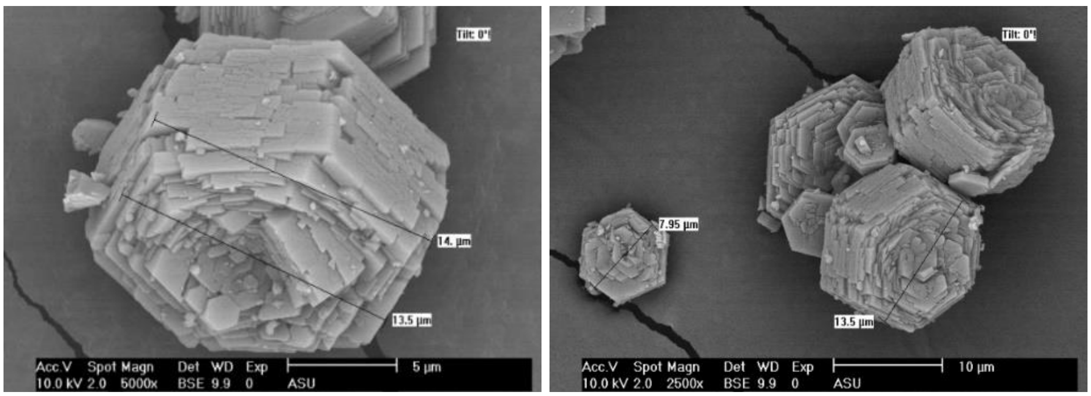


Figure 22. SEM images of MnSnSi/AlPO-5 on XL 30.

The images show that the particles were fully formed crystals of a hexagonal shape and the average particle size was between 13.5 -14 microns, with small crystals about 8 microns.

CHAPTER 4

OXYGEN ADSORPTION PROPERTIES OF THE ZEOLITES

The adsorption properties of the very first samples synthesized were investigated on a NETZSCH TG 209F1 Libra Thermogravimetric Analyzer (TGA). These were samples synthesized with TMG as the template. Each sample was degassed at 300^0C in flowing nitrogen for 12 hours then cooled down to 30^0C. Oxygen gas was then let through the sample for 12 hours. The other instrument used for oxygen adsorption was the 3Flex adsorption apparatus (Micrometrics). All samples that were investigated on the 3Flex were degassed for at least 24 hours and cooled to room temperature before oxygen adsorption experiments. The cool-down step usually lasted between 1-2 hours while the sample was still on the vacuum degassing unit on vacuum. The adsorptive gas in the 3Flex was pure lab-grade oxygen.

Briefly, the mechanism for adsorption in the 3Flex unit involves automatic evacuation of the sample to vacuum levels around the 10^{-6} Torr range, measuring the free space in the sample, and dosing the adsorptive gas into the sample at the set temperature as the pressure is raised from vacuum to 101.3 kPa. The adsorbed oxygen is then calculated using the amount dosed and the amount of oxygen in the free space. Nitrogen gas and helium were used as backfill gases interchangeably depending on the availability of either gas. In the latter experiments, helium was the preferred backfill gas because nitrogen slightly adsorbs in microporous zeolites at the experimental temperatures used while helium does not.

1. Results and Discussion

The results from adsorption experiments are not provided chronologically, but rather are provided in accordance to relevance or point under discussion.

1.1. Oxygen Adsorption in the Basic $AlPO_4$-5

Figure 23 shows a TGA mass change profile with and without oxygen flowing. These initial TGA experiments were conducted before confirming the crystal structure of the material because the two XRD units known at the time had broken down and the 3Flex was under maintenance. It was later discovered that these samples were amorphous, and therefore, the results provided in Figure 23 are for the purpose of providing a complete story only. These results are examples of so many experiments that were completed prior to obtaining the correct structure.

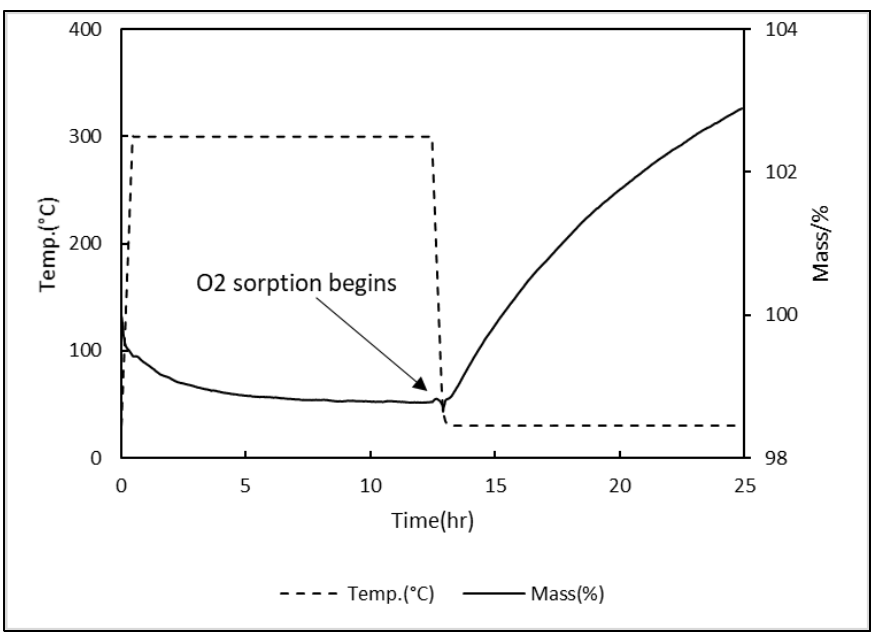


Figure 23. TGA oxygen adsorption profile of TMG-templated $AlPO_4$-5.

The initial mass loss at 300^0C was attributed to the purging of gases in the pores of the zeolite sample and the moisture losses. The change in mass at 300^0C was exceedingly small, therefore, chances are very minimal that template decomposition could have contributed to this mass loss as well. Additionally, the sample had previously been calcined at temperatures greater than 600^0C and, therefore, it was very unlikely that the sample still contained the template at the time of the TGA run. The increase in mass when the temperature was 30^0C and oxygen was flowing was initially interpreted as oxygen adsorption. However, the cause of that increase in mass is still vaguely understood to date for that amorphous sample. Unfortunately, no further experiments were completed on the samples before the TGA required further maintenance. All equipment except the 3Flex were shared by several projects and students and, therefore, were always busy.

Figure 24 shows oxygen adsorption isotherm of the basic $AlPO_4$-5 zeolite at 25^0C. The oxygen uptake observed in this sample was about 0.07 mmol of oxygen/g of $AlPO_4$-5. Oxygen uptake is more favorable at higher oxygen partial pressures.

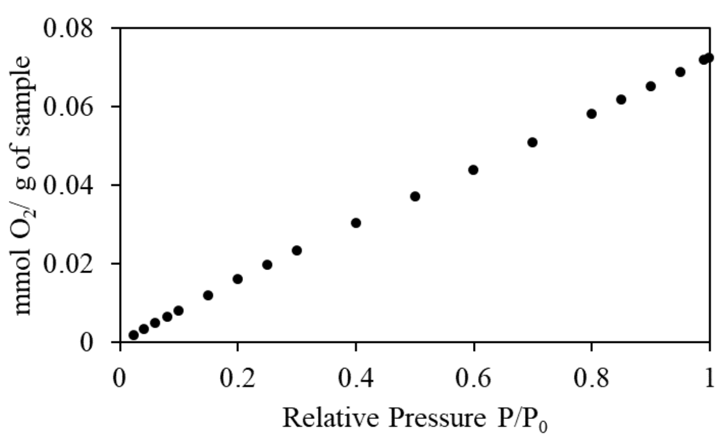


Figure 24. Oxygen adsorption isotherm in the basic AlPO4-5, by the 3Flex at 25^0C.

From computational studies [5], the basic $AlPO_4$-5 is expected to not adsorb any oxygen as mentioned earlier. However, results as seen in Figure 24 show some oxygen adsorption in the crystalline material even as little as it is. This is not a contradiction with theoretical studies. Theoretical studies and wet lab experiments, however, need to collaborate more to identify areas of improvement on either side. The result in Figure 24 is attributed to the imperfect structure of $AlPO_4$-5. There are contaminants or defects inherent from either synthesis procedures and handling or purity of the chemicals used in preparing the precursor gel which result in paramagnetic defect centers in the material which are responsible for gas adsorption[3]. The type of defects in the structure influence what type of gas is adsorbed and how much, and the spin concentrations of the defect centers influence how much of the gas is adsorbed[2].

1.2.Oxygen Adsorption in Substituted $AlPO_4$-5

Because the major substituted $AlPO_4$-5 in this work was Sn/AlPO-5 and MnSnSi/AlPO-5, their results dominate this section. However, some results for other substituted $AlPO_4$-5 materials such as Mo/AlPO-5, Si/AlPO-5, and Mn/AlPO-5, etc. which were a secondary focus are provided to a less extent for comparisons with the discovery MnSnSi/AlPO-5.

1.2.1.Weight Change in Sn/$AlPO_4$-5 with Pure Oxygen at 30^0C.

Figure 25 shows the TGA mass change profile with and without oxygen flow, used to understand oxygen adsorption in the TMG-templated Sn/AlPO-5. Similar to Figure 23, the result provided here are for the purpose of showing a somewhat complete story but this sample was later found to be amorphous. It is worth noting that so many zeolite samples were synthesized in between this one and other results provided and these results serve as examples for the rest of the data not shown.

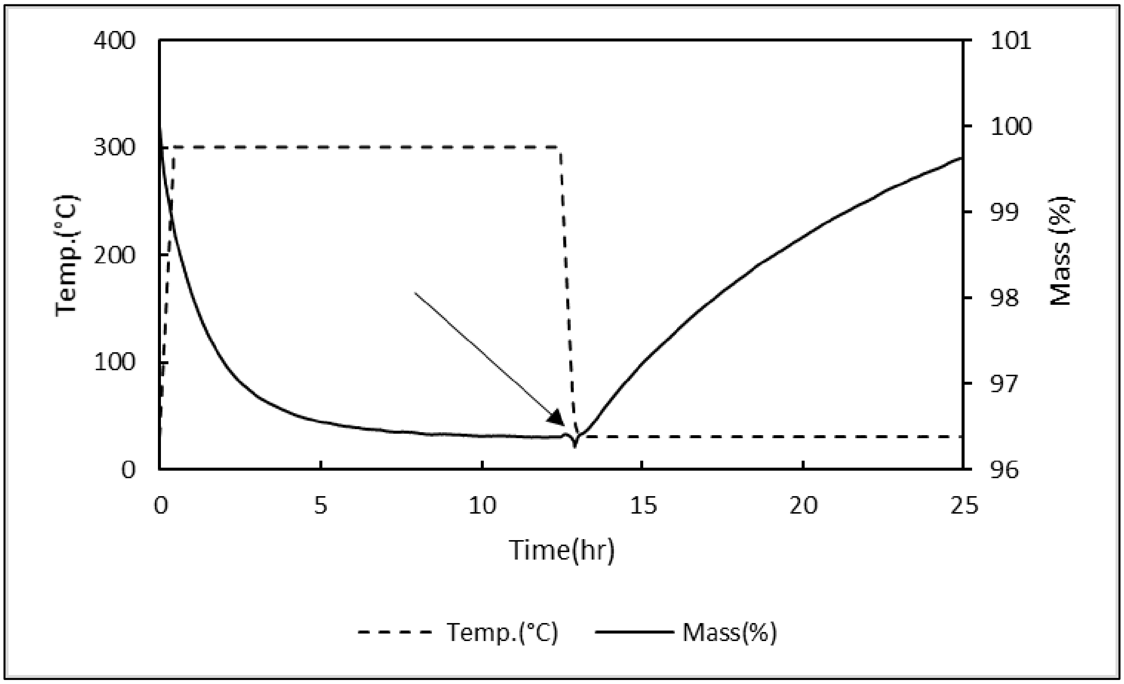


Figure 25. TGA oxygen adsorption profile of TMG-templated Sn/AlPO-5.

Like with the basic $AlPO_4$-5, mass drop at 300^0C was attributed to loss of previously adsorbed gases and moisture. Based on studies of related crystalline materials[51, 52], the increase in mass was attributed, at the time, to oxygen adsorption but it remains to be investigated for amorphous Sn/AlPO-5 samples.

Figure 26 was an extract of only the probable adsorption from Figure 23 and Figure 25 at 30^0C. It illustrates the difference in the mass profile change between the basic $AlPO_4$-5 and the Sn/$AlPO_4$-5.

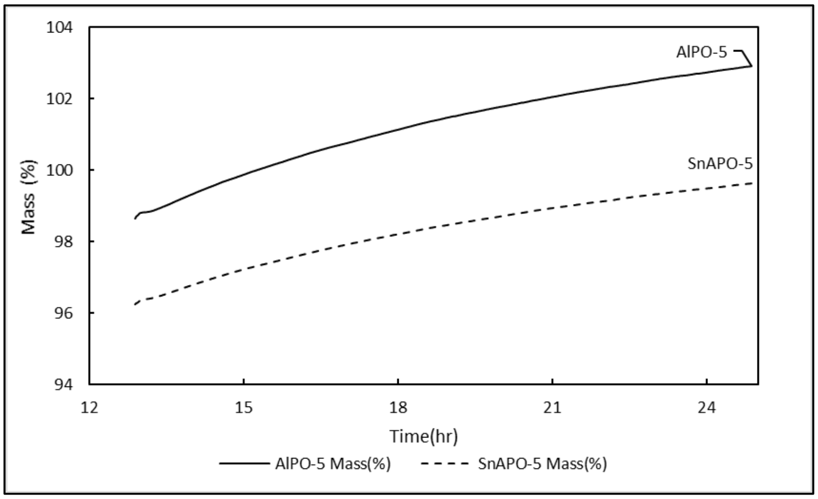


Figure 26. Comparison of TGA oxygen adsorption profiles of TMG-templated $AlPO_4$-5 and Sn/AlPO-5.

These results indicated that $AlPO_4$-5 was a better adsorbent at the time than Sn/AlPO-5 which aligned with the logic that doping $AlPO_4$-5 would only lead to Sn oxides blocking pores of the material and thus reducing the materials capability to adsorb oxygen. These results and interpretations had been supported by previous work completed on these two materials and related materials but with water and ammonia adsorption instead of oxygen adsorption[12, 53, 54]. However, because the samples were amorphous, those interpretations were not correct.

1.2.2.Weight Change in Sn/$AlPO_4$-5 in Air at 75^0C.

The TGA results of Sn/AlPO-5 completed on a different TGA unit than the one previously mentioned are shown in Figure 27. In this run, the sample was degassed in argon (Ar) at 400^0C and then cooled down to 75^0C. When air was turned on to flow through the cooled sample, all cycles (regenerated in Ar) show a small mass change that could be attributed to oxygen adsorption. It is worth noting that the sample investigated in this TGA was one of the best Sn/AlPO-5 sample, but a mass change in the order of magnitude of 0.1% was observed.

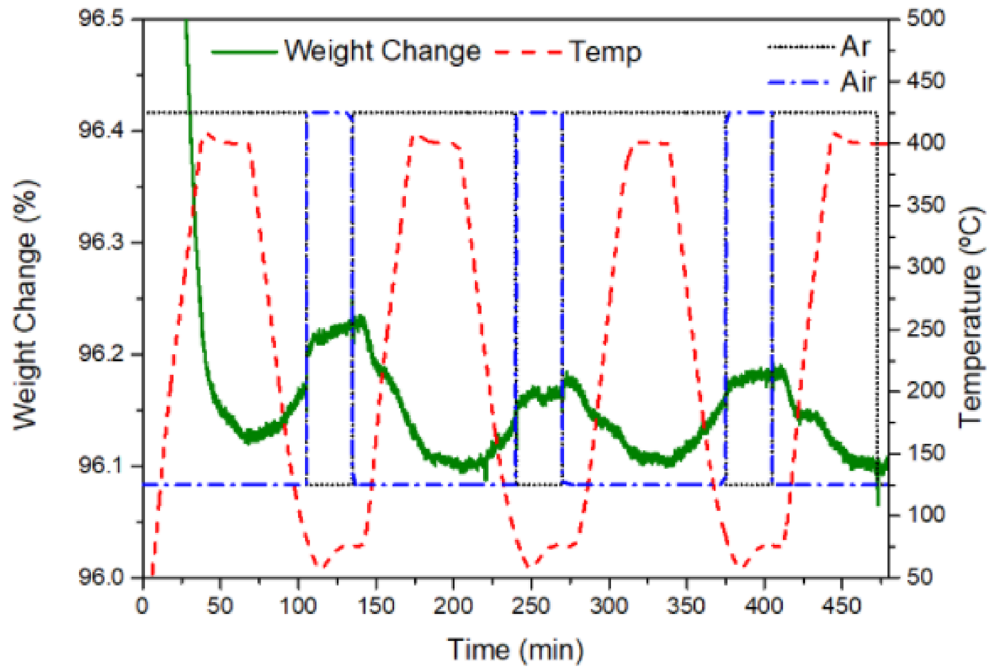


Figure 27. TGA weight change of Sn/AlPO-5 in flowing air.

Note that air was used in this run instead of pure oxygen. This experiment was repeated to investigate oxygen adsorption at 50^{0}C also and the results not shown here were similar to those presented in Figure 27.

1.2.3. Effect of Temperature and Dopant Concentration on Oxygen Adsorption in Sn/AlPO-5.

Oxygen uptake in Sn/AlPO-5 with temperature and molar concentration of dopant was investigated and results are shown in Figure 28. One of the samples represented by Sn X2 was double the molar amount of Sn in the sample represented by Sn. As temperature was increased between 25^{0}C and 100^{0}C, the oxygen uptake by generally Sn/AlPO-5 decreased. This result was first interpreted as a reflection of physical adsorption in the materials. However, subsequent experiments exhibited a termination of the desorption isotherms at a relative pressure (oxygen partial pressure) higher than the starting points of the adsorption isotherms as seen in Figure 31. That termination of the desorption isotherms is most likely due to some minimal irreversible chemical adsorption. Therefore, it is speculated that the oxygen adsorption at lower temperatures is due to both physical and chemical adsorption.

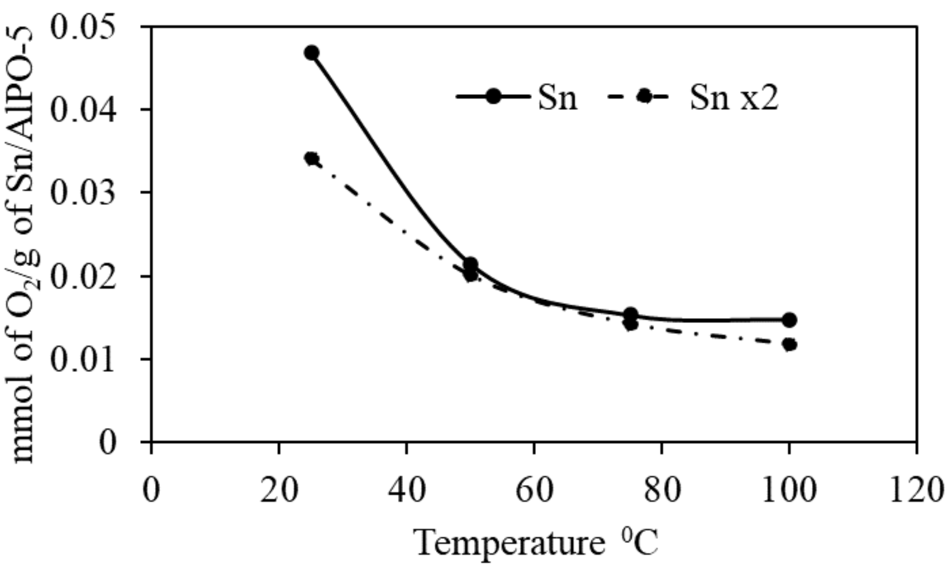


Figure 28. Effect of temperature and dopant concentration on the oxygen adsorption behavior of Sn/AlPO-5.

The lower oxygen uptake observed in the Sn/AlPO-5 with double the amount of Sn is largely attributed to the extra formation of Sn oxides that instead block the open channels of the zeolite that are essential for oxygen adsorption. The result also agrees with the idea that increasing the molar amount of the substituting atom lowers the overall spin concentration of the paramagnetic defects [(2)]. The overall adsorbed amounts in each

Sn/AlPO-5 for these samples were exceptionally low, therefore, the trend is the most useful information obtained in the experimental results in Figure 28. These results are also very slightly lower than the average oxygen uptake observed in most Sn/AlPO-5 samples.

1.2.4. Effect of Temperature and Dopant Concentration on Nitrogen Adsorption in Sn/AlPO-5.

Similar to oxygen adsorption, experiments were conducted with nitrogen gas as the adsorptive gas and some of the results obtained are seen in Figure 29. The results were remarkably similar to those of oxygen adsorption in Figure 28. This result may suggest physical adsorption but for the same reason, as previously mentioned, both physical and chemical adsorption may occur at these low temperatures.

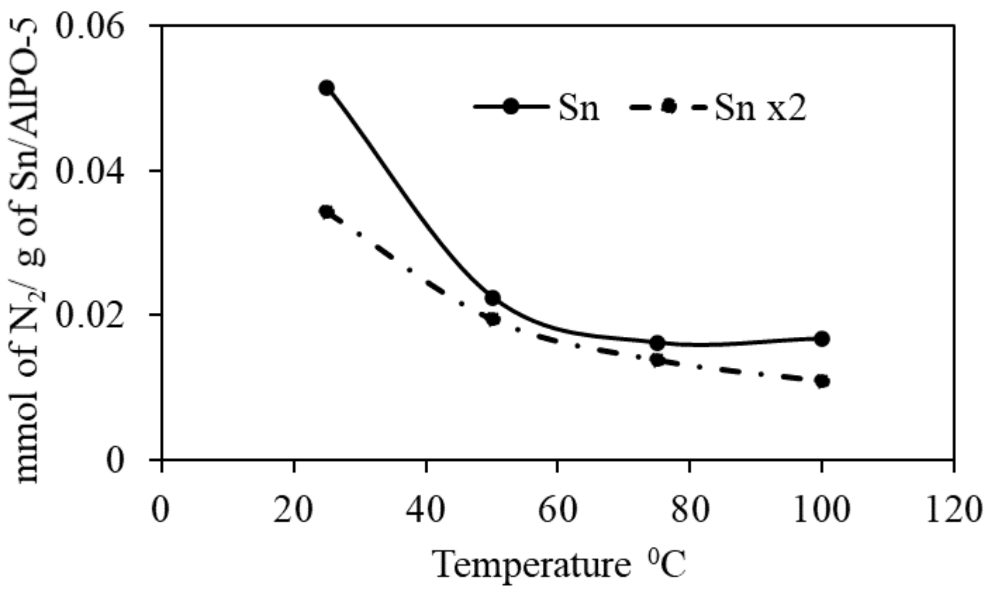


Figure 29. Effect of temperature and dopant concentration on the nitrogen adsorption behavior of Sn/AlPO-5.

Since sorbents capable of oxygen adsorption at temperatures closer to 25^{0}C were desired and all experiments run indicated better oxygen uptake at lower temperatures as seen in Figure 28, more experiments with the rest of the materials were conducted at 25^{0}C.

1.2.5. Oxygen adsorption in Mn/AlPO-5, Mo/AlPO-5, and Si/AlPO-5.

Figure 30 represents the isotherms for the average oxygen adsorption data in Mn/AlPO-5, Mo/AlPO-5, and Si/AlPO-5 at 25^{0}C. Mo/AlPO-5 exhibits the highest average among the single-metal substituted $AlPO_4$-5 as seen in Figure 28 and Figure 30.

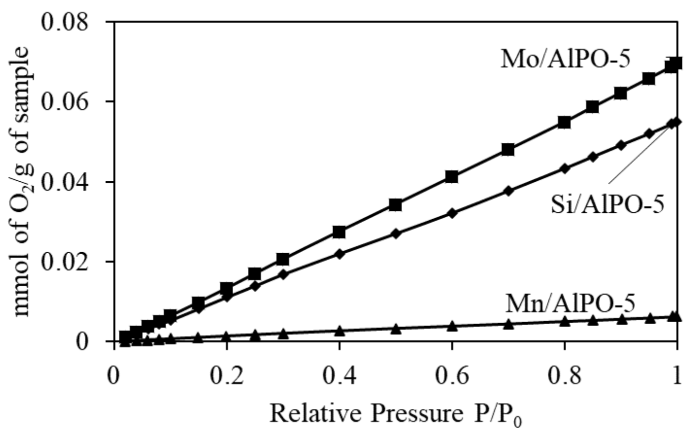


Figure 30. O_2 adsorption isotherms in Mo/AlPO-5, Si/AlPO-5, and Mn/AlPO-5 at 25°C.

The trend Mo/AlPO-5 > Si/AlPO-5 > Mn/AlPO-5 in the amount of total oxygen uptake at room temperature agrees with DFT findings in published literature [(5),] where oxygen adsorption energy for Mo/AlPO-5 in both Site 3 and Site 4 of the sorbent was between ~ -2.4 and -3 eV, Si/AlPO-5 was between ~ -2 and -2.5 eV for both Sites 3 and 4 and Mn/AlPO-5 was between ~ -1 and 1.5 eV. It is, therefore, expected that sorbate-sorbent interactions are in the order; Mo/AlPO-5 > Si/AlPO-5 >Mn/AlPO-5 and thus the corresponding sorption trend.

1.2.6.Oxygen Adsorption in MnSnSi/AlPO-5.

From the results presented so far, it seemed more reasonable to concentrate efforts on Sn/AlPO-5 and Mo/AlPO-5. However, at that stage, the multi-metal sorbent MnSnSi/AlPO-5 had been synthesized and characterized in an attempt to improve Sn/AlPO-5. Therefore, the new focus became Sn/AlPO-5, Mo/AlPO-5 and MnSnSi/AlPO-5 which yielded promising results in subsequent experiments. Among the three zeolites, MnSnSi/AlPO-5 exhibited the highest oxygen uptake of 0.84 mmol/g compared to 0.47 mmol/g of Sn/AlPO-5 and 0.56 mmol/g of Mo/AlPO-5 as seen in Figure 31. Additionally, the average oxygen adsorption observed of MnSnSi/AlPO-5 was in all runs greater than either one of the Sn/AlPO-5 and Mo/AlPO-5 as seen in Figure 32, thus MnSnSi/AlPO-5 became the primary focus. Figure 31 shows isotherms of the maximum observed oxygen adsorption in Sn/AlPO-5, Mo/AlPO-5, and MnSnSi/AlPO-5.

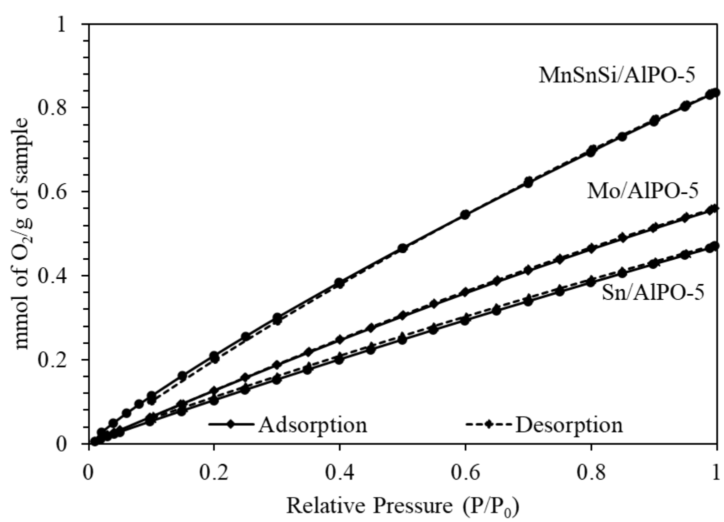


Figure 31. Observed maximum oxygen adsorption capacities of Sn/AlPO-5, Mo/AlPO-5, and MnSnSi/AlPO-5 at room temperature (25 °C).

To the best of my knowledge, these results are the first of a kind and the combination of the dopants selected in MnSnSi/AlPO-5 is unique. While the oxygen adsorption energy in Mo/AlPO-5 and Sn/AlPO-5 based on DFT studies conducted by Wilson et al.[5] is fundamental and primary in the explanation of the differences between Mo/AlPO-5 and Sn/AlPO-5 observed oxygen-uptake, there is more to the MnSnSi/AlPO-5 material.

For MnSnSi/AlPO-5, the increase in ring-size (network volume) with relatively smaller increase in overall mass of the material plays a big role in the material's adsorption capacity or behavior. An increase in ring size with the relatively lower increase in mass results in an increase in total micropore volume of the material whence larger BET specific area. With higher surface area comes more sorbate-sorbent interactions and thus a higher oxygen uptake. Alternatively, an increase in ring size results in an increase in spin concentration of the paramagnetic defects[2] and thus higher oxygen uptake. Notably from Figure 31, and as previously mentioned in previous sections, the desorption isotherms follow very closely a similar path to the adsorption isotherms but terminate at relative pressures (higher oxygen partial pressures) slightly higher than the starting pressure. The implication of this is that desorption in these zeolite materials is possible at low temperatures and that there is truly little irreversible adsorption or filling of the active sites. This result suggests some chemical adsorption.

As more experiments were conducted, it was discovered that the zeolites exhibit non-uniform adsorption with specimens from the same batch tested at different intervals yielding from little to high oxygen uptake and vice versa. It is important to note that the inconsistency problem/ non-uniform adsorption was not observed in MnSnSi/AlPO-5 alone, but rather in all the three samples that showed high maximums i.e., MnSnSi/AlPO-5, Mo/AlPO-5 and Sn/AlPO-5. Figure 32 shows the isotherm that represent the average oxygen adsorption observed in most MnSnSi/AlPO-5 samples labeled (IMnSnSi1 and IMnSnSi2). MnSnSi/AlPO-5 samples labeled as IMnSnSi1 and IMnSnSi2 had very similar adsorption behaviors and, therefore, only one isotherm (of IMnSnSi1) is shown in both Figure 31 and Figure 32. Some example oxygen adsorption data can be found in Appendix B for IMnSnSi1, IMnSnSi2, and IMnSnSi3.

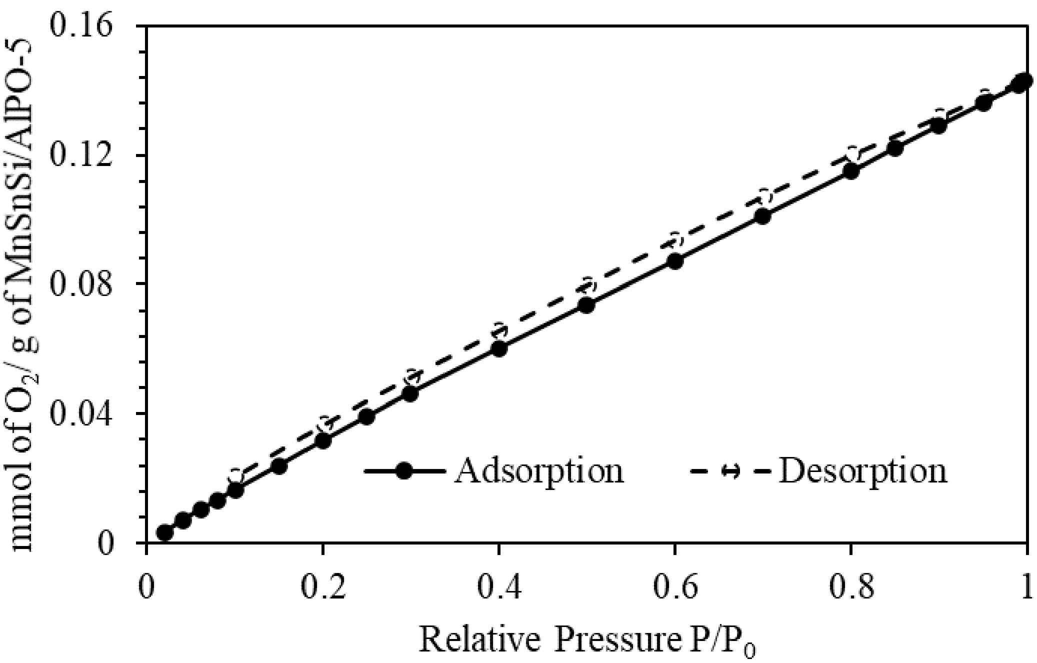


Figure 32. Average oxygen adsorption and desorption in most MnSnSi/AlPO-5 samples at 25 °C.

Figure 33 is also provided for emphasis showing average adsorption capacity of IMnSnSi3 of about 0.17 mmol/g of sample which is close to the 0.14 mmol/g of IMnSnSi1 and IMnSnSi2 at 25^{0}C and ~100kPa. It is to be noted that only very few experimental runs were completed on IMnSnSi3. It is, therefore, possible that perhaps with more experiments, which were not possible because of a time constraint, the maximum adsorption capacity of IMnSnSi3 could be about the same as that of IMnSnSi1 and IMnSnSi2. For clarity IMnSnSi1, IMnSnSi2, and IMnSnSi3 are all batches of MnSnSi/AlPO-5 synthesized at different times. So, if a sample/ specimen was drawn from any of the batches, it was labeled according to the batch.

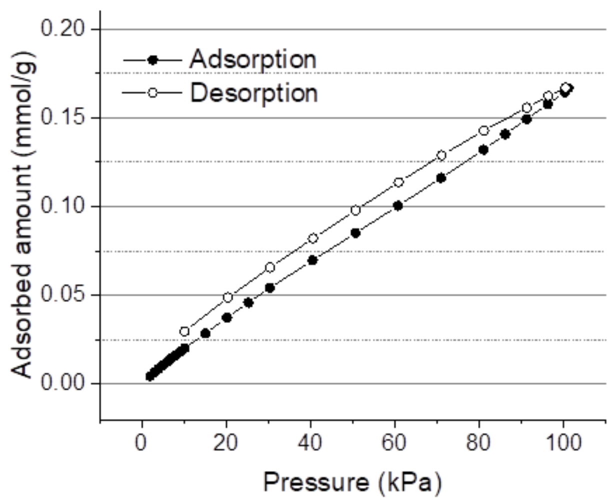


Figure 33. Adsorption and desorption in IMnSnSi3 at room temperature.

The possible explanations for the non-uniformity in oxygen adsorption in the zeolite samples are; non-uniform doping. This is the most-likely cause. Non-uniform doping in materials is not a unique phenomenon. When this occurs, the concentration of paramagnetic defect centers created in the structure of the material are not uniformly distributed and, therefore, depending on where the adsorptive molecule falls, the amount adsorbed will vary. The cumulative effect of this would then reflect in the entire specimen examined. Alternatively, it is understood that there is virtually no perfect system or perfect procedure. While the synthesis procedures herein targeted substitution at Al sites, there are still chances that the substituting atoms might still substitute on some P sites. This means that the achieved substitution might not be 100% at Al sites only. This requires further investigation, remains an open discussion, and it calls for a closer coordination between simulations and experimental approaches.

1.2.7. Breakthrough Experiments on MnSnSi/AlPO-5

On a different sample of MnSnSi/AlPO-5, labeled as IMnSnSi3, breakthrough experiments were conducted to help in the design and optimization of TSA processes. The adsorption bed was prepared with 30g of IMnSnSi3 and 80g of silica grain. The sample was regenerated at 350^0C for 12 hours with N_2 at 100 ml/min. After 12 hours, the sample was cooled down to 25^0C and the N_2 stream was switched to a stream with N_2/O_2 mixture of concentrations 1% and 10% oxygen simultaneously. The concentration of the outlet stream was measured and results are shown in Figure 34 and Figure 35 respectively.

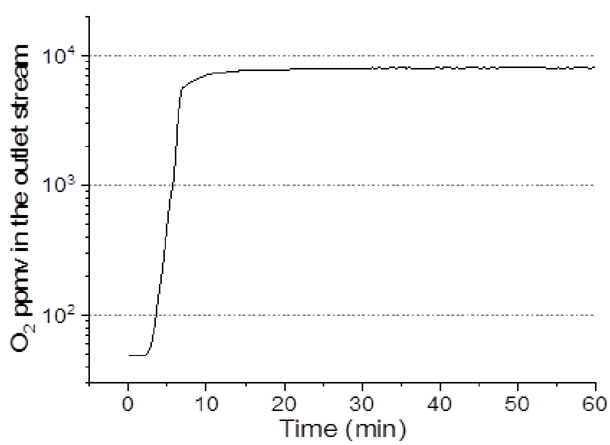


Figure 34. IMnSnSi3 breakthrough curve with 1% O_2.

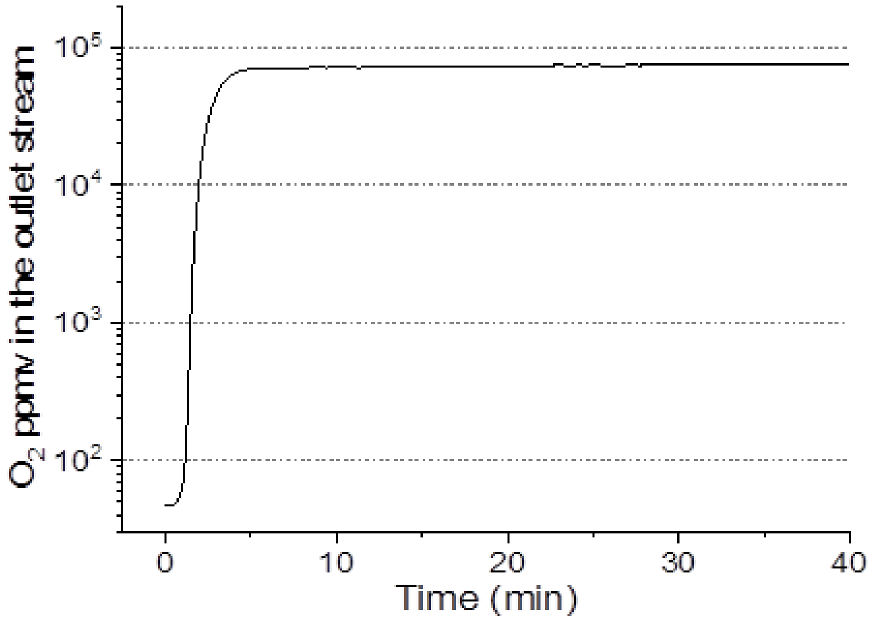


Figure 35. IMnSnSi3 breakthrough curve with 10% O_2.

From both Figure 34 and Figure 35, adsorption equilibrium is reached under 15 minutes. The breakthrough capacity for 1% O_2 was 3.5 minutes while that for 10% O_2 was about 1.25 minutes. The breakthrough capacities for IMnSnSi3 with 1% O_2 and 10% O_2 were 0.0083 mmol/g and 0.028 mmol/g respectively. These values are exceptionally low. However, it is important to keep in mind that these results are from extremely limited preliminary experimental runs. Further investigation would be necessary in order to verify this especially because in general MnSnSi/AlPO-5 has shown really good adsorption capacities, if the non-uniform adsorption concern is ignored momentarily. An especially important takeaway from both the isotherm data on MnSnSi/AlPO-5 and the breakthrough data is that this zeolite material adsorbs more oxygen at higher oxygen partial pressures as also shown in Figure 36.

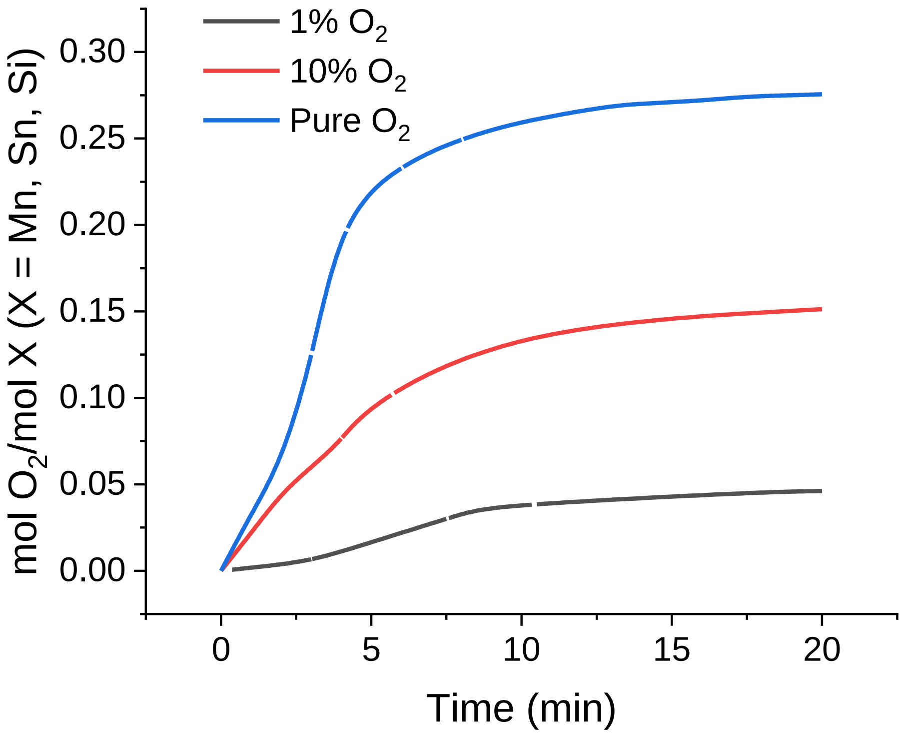


Figure 36. Effect of O_2 partial pressure on O_2 adsorption in MnSnSi/AlPO-5.

The results shown in Figure 36 are from a combination of IMnSnSi1 and IMnSnSi3 but clearly emphasize the point that MnSnSi/AlPO-5 adsorbs more oxygen at higher O_2 partial pressures since pure oxygen has the highest adsorption amount as seen in the blue curve, followed by the 10% O_2 mixture of N_2/O_2 and lastly by the 1% O_2 mixture.

1.2.8. Temperature Screening of MnSnSi/AlPO-5

The sample was initially regenerated at 350^{0}C for 12 hours in flowing nitrogen. Temperature screening was conducted in the TGA for temperatures ranging between 30^{0}C and 350^{0}C with 10% oxygen and results are shown in Figure 37.

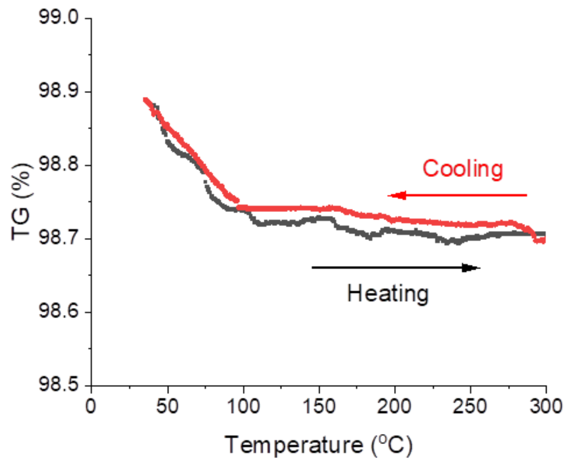


Figure 37. Temperature screening of MnSnSi/AlPO-5.

The sample used in Figure 37 is IMnSnSi3. It is visible by the rise in TG% at lower temperatures that adsorption of oxygen in MnSnSi/AlPO-5 is more favorable at lower temperatures. However, Figure 38 is provided for further illustration.

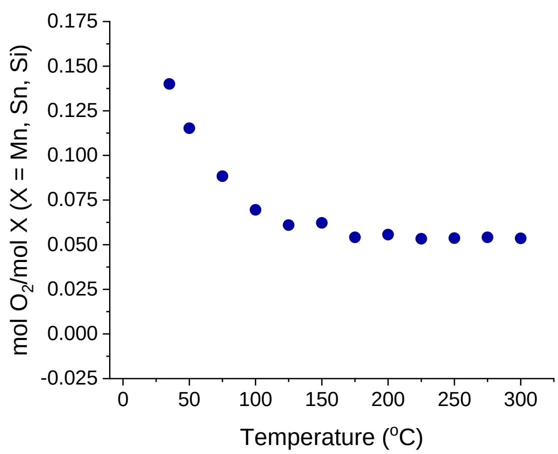


Figure 38. Effect of temperature on O_2 adsorption in MnSnSi/AlPO-5.

The sample used was IMnSnSi3. In Figure 38, the amount of oxygen uptake decreases with increasing temperature, signifying that lower temperatures are more favorable for oxygen adsorption in MnSnSi/AlPO-5.

1.2.9. Kinetics and Modeling of Adsorption Equilibrium of MnSnSi/AlPO-5.

Kinetics experiments were conducted on the IMnSnSi1 samples and the diffusivity of oxygen in MnSnSi/AlPO-5 calculated to be 6.4 $\times 10^{-12}$ m^2/s from simplifications of Equation 4 from Ruthven [55] and based on average oxygen adsorption data.

$$\frac{m_t}{m_\infty} = 6\left(\frac{D_c t}{r_c^2}\right)^{\frac{1}{2}}\left[\frac{1}{\sqrt{\pi}} + 2\sum_{n=1}^{\infty} i\,erfc\left(\frac{nr_c}{\sqrt{D_c t}}\right) - 3\frac{D_c t}{r_c^2}\right] \quad [4]$$

The Langmuir-Freundlich (L-F) equation seen in Equation 5 was used to fit the experimental data as seen in Figure 39.

$$q = q^* \frac{(bp)^{\frac{1}{n}}}{1 + (bp)^{\frac{1}{n}}} \quad [5]$$

$$b = b_0 exp\left[\frac{E}{R}\left(\frac{1}{T} - \frac{1}{T_0}\right)\right]$$

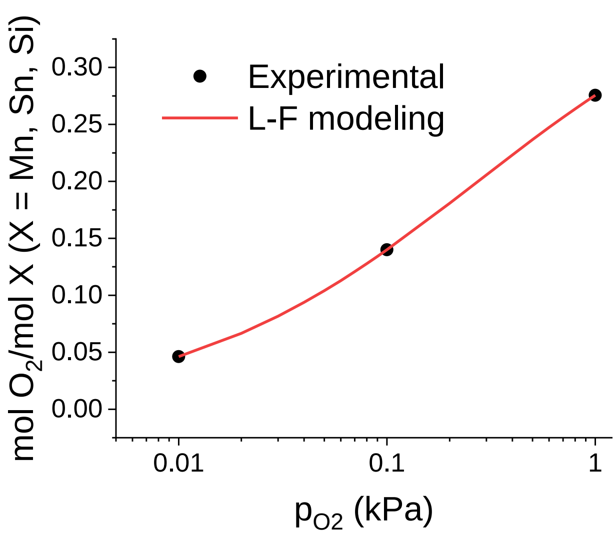


Figure 39. Modeling of adsorption equilibrium.

$$T_0 = 308.15K$$

$$b_0 = 3.685\ bar^{-1}$$

$$q^* = 3.999 \frac{mol}{mol}$$

$$n = 1.62$$

Experimental conditions: 35^0C, 1%, 10%, and pure oxygen. From Figure 39, the L-F model and the data fit well.

1.3. Sorbent Degeneration and Regeneration in Sn/AlPO-5, Mo/AlPO-5, and MnSnSi/AlPO-5.

Among the best samples, sorbent degeneration or irreversible filling of the active sites when used several times was investigated by running the high adsorption samples five times. In between each run, the samples were re-degassed at 400^0C for at least 16 hours on the vacuum degassing unit. Then nitrogen was pumped through the samples for 1-5 hours.

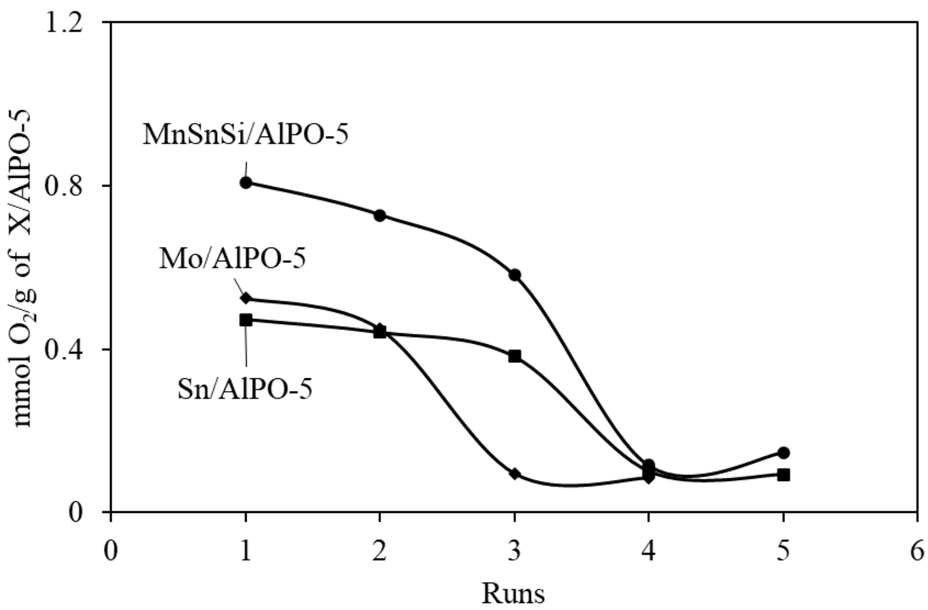


Figure 40. Degeneration of Sn/AlPO-5, Mo/AlPO-5, and MnSnSi/AlPO-5 adsorbents used over time.

All the samples tested showed degeneration of sorbents as observed in the trend of decreasing oxygen uptake over runs in Figure 40. This is due to the cumulative filling of the active sites. Each run of oxygen adsorption resulted in a small percentage of the active sites irreversibly filled. Over several runs, the cumulative effect of this phenomenon becomes more evident. This is also another evidence for the presence of chemical adsorption. Sorbent regeneration was not possible for regeneration times less than 6 hours with flowing nitrogen through the samples.

2. Nature of Adsorbed Oxygen in the Substituted $AlPO_4$-5

The adsorbents were investigated for the nature of the adsorbed oxygen by conducting a continuous wave x-band EPR test for O_2^- at 100K. First, pulsed EPR at 77K was used on 30 mg of the starting sample which had exhibited high oxygen adsorption but had gone through a complete adsorption-desorption process. It is worth noting that all samples tested except the fresh samples had gone through the complete adsorption-desorption process at the time. The 30 mg sample did not yield any EPR signals. The sample was then increased by 60 mg. However, this also did not yield any signals for O_2^-. This is the time the EPR mode was switched from pulsed at 77K to continuous wave at 100K. The following information about sample labeling is provided for ease of interpretation of results in Figure 41. A fresh sample of the basic $AlPO_4$-5 was labeled as Sample A and used as the control sample, a used sample of MnSnSi/AlPO-5 (IMnSnSi1) was labeled as B1. This sample had previously shown high adsorption of about 0.84 mmol of O_2/g of sample but had gone through the complete adsorption-desorption process.

Another MnSnSi/AlPO-5 (IMnSnSi1) sample was labeled B2. This was a fresh sample not previously used on gas adsorption. A fresh sample of Sn/AlPO-5 was labeled Sample C, and a used sample of Sn/AlPO-5 that had previously shown adsorption of about 0.47 mmol of O_2/g of the sample was labeled Sample D.

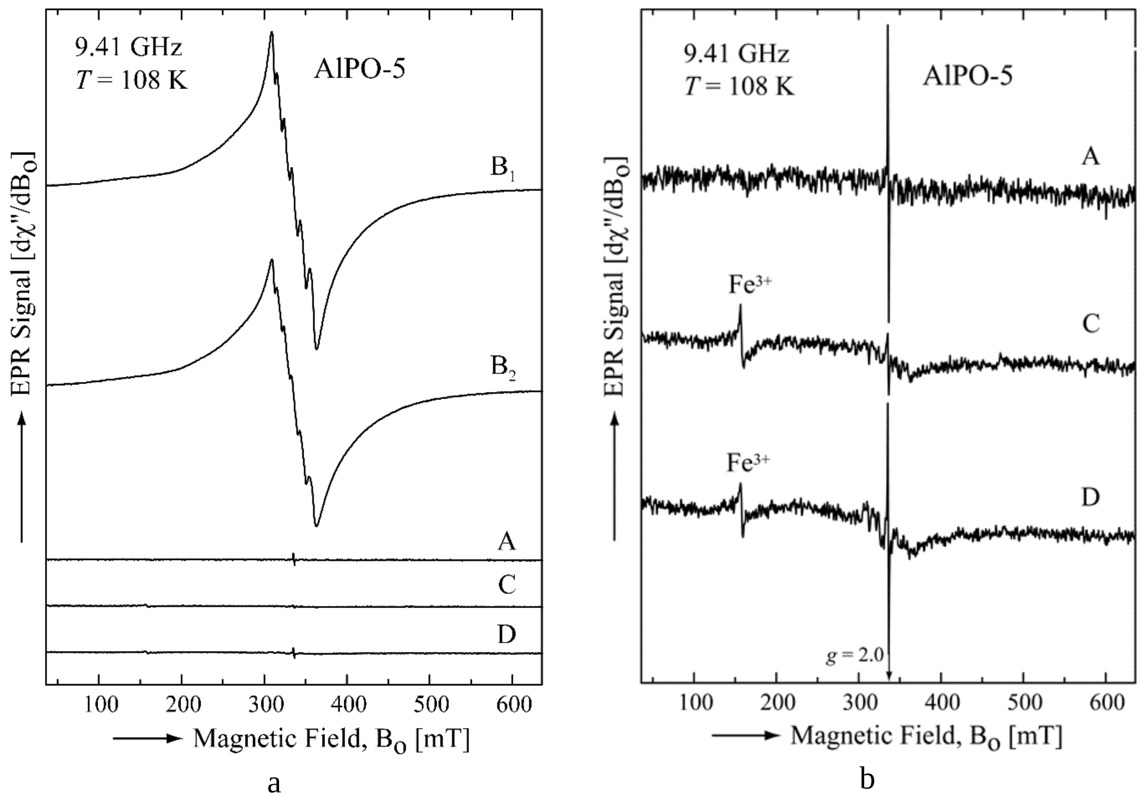


Figure 41. EPR spectra, at 100K, of fresh $AlPO_4$-5 (A), used MnSnSi/AlPO-5 (B1), fresh MnSnSi/AlPO-5 (B2), fresh Sn/AlPO-5 (C), and used Sn/AlPO-5 (D).

All samples showed no obvious signals for O_2^-. MnSnSi/AlPO-5 samples (B1 and B2) showed two broad Mn (II) signals[56, 57] at about B_0=340 mT as seen in Figure 41 a. It could be expected that O_2^- signals could overlap with Mn(II) signals since they are typically expected at about similar B_o[58-60]. In this case, however, the possibility of overlap is less likely by the mere fact that the spectra for used MnSnSi/AlPO-5 are identical to that of the fresh MnSnSi/AlPO-5. The $AlPO_4$-5 sample (A), and both Sn/AlPO-5 samples (C and D) show signals at about the same magnetic field or g ~ 2.0 as MnSnSi/AlPO-5 samples but the peaks are much narrower than in the latter. See Figure 41 b. These signals are probably due to an O_2^- related defect that is in all of these samples and is inherent from the synthesis procedures. It is possible to develop this kind of defect during calcination in limited air. Both Sn/AlPO-5 samples also exhibit a peak at the lower magnetic field of about B_o= 150 mT. This signal is attributed to the presence of a contaminant of Fe^{3+} in both of these samples [(61)]. The lack of O_2^- signals in the used samples is speculated to be due to a successful desorption process that leaves too little O_2^- bonded on active sites to generate enough signals to be picked up by EPR. Further investigation is needed especially for samples that have adsorbed oxygen but have not gone through the desorption process.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

Substituted $AlPO_4$-5 was successfully synthesized and characterized with techniques such as XRD for structural confirmation and phase identification and other techniques such as N_2 adsorption for BET surface area and other textural properties. Elemental analysis with EDS and XPS, and morphology and crystal size investigations with SEM were conducted. O_2 adsorption properties of the zeolites were investigated and it was found that substituted $AlPO_4$-5, where the substituting atom is one of the reported transition metal atoms herein adsorbs O_2 but remarkably low levels and the materials exhibit non-uniform adsorption. MnSnSi/AlPO-5 was discovered as a promising (and better alternative to the single-metal substituted $AlPO_4$-5) candidate for O_2 adsorption with a highest capacity of 0.84 mmol/g and an average between 0.1 - 0.17 mmol of O_2/ g.

It is recommended that future work is focused on improving the doping process in the synthesis of MnSnSi/AlPO-5 to improve the uniformity of doping and achieve uniform adsorption. It is also recommended that detailed mathematical models are used to assess the suitability of MnSnSi/AlPO-5 for use in pressure swing or temperature swing adsorption (PSA or TSA). In order to quantify the merit or efficiency of MnSnSi/AlPO-5 as an oxygen adsorbent, a lab-scale PSA or TSA cycle or a computer simulation is recommended to breaking point. Further investigation about the selectivity of MnSnSi/AlPO-5 and other substituted $AlPO_4$-5 sorbents is also needed and this should open more discussions and coordination between the simulations/ computations die-hards and wet-lab/ experiments fanatics for success at improving the materials capability.

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APPENDIX A

SAMPLE XRD DATA

[Measurement conditions]			
Sample identification	Sn/AlPO-5		
Comment			
Anode material	Cu		
K-Alpha1 wavelength	1.540598		
K-Alpha2 wavelength	1.544426		
Ratio K-Alpha2/K-Alpha1	0.5		
Divergence slit	Fixed	0.76mm	
Monochromator used	NO		
Generator voltage	40		
Tube current	15		
File date and time	########		
Unit cell			
h k l	0 0 0		
Scan axis	Gonio		
Scan range	4.978	79.9999	
Scan step size	0.086932		
No. of points	863		
Scan type	CONTINUOUS		
Time per step	74.205		
[Scan points]		Max	28290
Angle	TimePerStep	Intensity	ESD
5.021466	74.205	7190	84.7939
5.108397	74.205	6893	83.0241
5.195329	74.205	6631	81.431
5.28226	74.205	6401	80.0062
5.369192	74.205	6083	77.9936
5.456123	74.205	5841	76.4264
5.543055	74.205	5764	75.921
5.629986	74.205	5584	74.7262
5.716918	74.205	5454	73.8512
5.803849	74.205	5264	72.5534
5.890781	74.205	5158	71.8192
5.977712	74.205	4932	70.2282
6.064644	74.205	4548	67.4389
6.151576	74.205	4022	63.4192

6.238507	74.205	3774	61.4329
6.325439	74.205	3518	59.3127
6.41237	74.205	3357	57.9396
6.499302	74.205	3350	57.8792
6.586233	74.205	3302	57.463
6.673165	74.205	3110	55.7674
6.760096	74.205	3163	56.2406
6.847028	74.205	2997	54.7449
6.933959	74.205	3112	55.7853
7.020891	74.205	3467	58.8812
7.107822	74.205	3771	61.4085
7.194754	74.205	4225	65
7.281685	74.205	5325	72.9726
7.368617	74.205	7213	84.9294
7.455548	74.205	9163	95.7236
7.54248	74.205	10844	104.1345
7.629411	74.205	13845	117.6648
7.716343	74.205	20131	141.8838
7.803274	74.205	28290	168.1963
7.890206	74.205	10978	104.776
7.977137	74.205	4418	66.468
8.064069	74.205	3318	57.6021
8.151	74.205	2814	53.0471
8.237932	74.205	2498	49.98
8.324864	74.205	2306	48.0208
8.411795	74.205	2262	47.5605
8.498727	74.205	2107	45.9021
8.585658	74.205	2054	45.3211
8.67259	74.205	2037	45.1331
8.759521	74.205	2064	45.4313
8.846453	74.205	2019	44.9333
8.933384	74.205	2035	45.111
9.020316	74.205	1992	44.6318
9.107247	74.205	2010	44.833
9.194179	74.205	1955	44.2154
9.28111	74.205	1863	43.1625
9.368042	74.205	1919	43.8064
9.454973	74.205	1853	43.0465
9.541905	74.205	1934	43.9773
9.628836	74.205	1847	42.9767
9.715768	74.205	1774	42.1189

9.802699	74.205	1836	42.8486
9.889631	74.205	1736	41.6653
9.976562	74.205	1770	42.0714
10.06349	74.205	1714	41.4005
10.15043	74.205	1704	41.2795
10.23736	74.205	1679	40.9756
10.32429	74.205	1707	41.3159
10.41122	74.205	1725	41.5331
10.49815	74.205	1648	40.5956
10.58508	74.205	1695	41.1704
10.67201	74.205	1675	40.9268
10.75895	74.205	1733	41.6293
10.84588	74.205	1605	40.0625
10.93281	74.205	1646	40.5709
11.01974	74.205	1559	39.4842
11.10667	74.205	1663	40.7799
11.1936	74.205	1600	40
11.28054	74.205	1593	39.9124
11.36747	74.205	1606	40.0749
11.4544	74.205	1560	39.4968
11.54133	74.205	1584	39.7995
11.62826	74.205	1580	39.7492
11.71519	74.205	1531	39.128
11.80212	74.205	1500	38.7298
11.88906	74.205	1535	39.1791
11.97599	74.205	1520	38.9872
12.06292	74.205	1499	38.7169
12.14985	74.205	1487	38.5616
12.23678	74.205	1511	38.8716
12.32371	74.205	1460	38.2099
12.41064	74.205	1504	38.7814
12.49758	74.205	1604	40.05
12.58451	74.205	1547	39.3319
12.67144	74.205	1647	40.5832
12.75837	74.205	1847	42.9767
12.8453	74.205	2136	46.2169
12.93223	74.205	2328	48.2494
13.01917	74.205	2762	52.5547
13.1061	74.205	3604	60.0333
13.19303	74.205	5059	71.1266
13.27996	74.205	3889	62.3618

13.36689	74.205	2100	45.8258
13.45382	74.205	1685	41.0488
13.54075	74.205	1603	40.0375
13.62769	74.205	1488	38.5746
13.71462	74.205	1473	38.3797
13.80155	74.205	1483	38.5097
13.88848	74.205	1450	38.0789
13.97541	74.205	1393	37.3229
14.06234	74.205	1389	37.2693
14.14928	74.205	1432	37.8418
14.23621	74.205	1377	37.108
14.32314	74.205	1433	37.855
14.41007	74.205	1347	36.7015
14.497	74.205	1383	37.1887
14.58393	74.205	1389	37.2693
14.67086	74.205	1439	37.9342
14.7578	74.205	1625	40.3113
14.84473	74.205	1664	40.7922
14.93166	74.205	1879	43.3474
15.01859	74.205	2140	46.2601
15.10552	74.205	2590	50.892
15.19245	74.205	3043	55.1634
15.27939	74.205	2327	48.239
15.36632	74.205	1618	40.2244
15.45325	74.205	1465	38.2753
15.54018	74.205	1350	36.7423
15.62711	74.205	1366	36.9594
15.71404	74.205	1364	36.9324
15.80097	74.205	1354	36.7967
15.88791	74.205	1332	36.4966
15.97484	74.205	1282	35.805
16.06177	74.205	1339	36.5923
16.1487	74.205	1313	36.2353
16.23563	74.205	1343	36.647
16.32256	74.205	1336	36.5513
16.40949	74.205	1331	36.4829
16.49643	74.205	1336	36.5513
16.58336	74.205	1338	36.5787
16.67029	74.205	1310	36.1939
16.75722	74.205	1320	36.3318
16.84415	74.205	1277	35.7351

16.93108	74.205	1289	35.9026
17.01802	74.205	1317	36.2905
17.10495	74.205	1239	35.1994
17.19188	74.205	1216	34.8712
17.27881	74.205	1272	35.6651
17.36574	74.205	1291	35.9305
17.45267	74.205	1273	35.6791
17.5396	74.205	1287	35.8748
17.62654	74.205	1365	36.9459
17.71347	74.205	1273	35.6791
17.8004	74.205	1323	36.3731
17.88733	74.205	1357	36.8375
17.97426	74.205	1325	36.4005
18.06119	74.205	1324	36.3868
18.14813	74.205	1270	35.6371
18.23506	74.205	1324	36.3868
18.32199	74.205	1338	36.5787
18.40892	74.205	1301	36.0694
18.49585	74.205	1290	35.9166
18.58278	74.205	1376	37.0945
18.66971	74.205	1391	37.2961
18.75665	74.205	1376	37.0945
18.84358	74.205	1332	36.4966
18.93051	74.205	1430	37.8153
19.01744	74.205	1422	37.7094
19.10437	74.205	1486	38.5487
19.1913	74.205	1477	38.4318
19.27824	74.205	1458	38.1838
19.36517	74.205	1623	40.2865
19.4521	74.205	1701	41.2432
19.53903	74.205	1996	44.6766
19.62596	74.205	2658	51.5558
19.71289	74.205	3354	57.9137
19.79982	74.205	4212	64.8999
19.88676	74.205	6025	77.6209
19.97369	74.205	9216	96
20.06062	74.205	8600	92.7362
20.14755	74.205	4780	69.1375
20.23448	74.205	2586	50.8527
20.32141	74.205	2175	46.6369
20.40834	74.205	2017	44.911

20.49528	74.205	1904	43.6348
20.58221	74.205	1804	42.4735
20.66914	74.205	1783	42.2256
20.75607	74.205	1900	43.589
20.843	74.205	1950	44.1588
20.92993	74.205	2296	47.9166
21.01687	74.205	2711	52.0673
21.1038	74.205	3439	58.643
21.19073	74.205	4235	65.0769
21.27766	74.205	5079	71.2671
21.36459	74.205	6749	82.1523
21.45152	74.205	9182	95.8228
21.53845	74.205	9296	96.4158
21.62539	74.205	5540	74.4312
21.71232	74.205	3476	58.9576
21.79925	74.205	2644	51.4198
21.88618	74.205	2502	50.02
21.97311	74.205	2335	48.3218
22.06004	74.205	2439	49.3862
22.14698	74.205	2555	50.547
22.23391	74.205	3270	57.1839
22.32084	74.205	4340	65.8787
22.40777	74.205	5872	76.629
22.4947	74.205	7555	86.9195
22.58163	74.205	10893	104.3695
22.66856	74.205	15369	123.9718
22.7555	74.205	14239	119.3273
22.84243	74.205	8129	90.161
22.92936	74.205	4636	68.0882
23.01629	74.205	3126	55.9106
23.10322	74.205	2460	49.5984
23.19015	74.205	2161	46.4866
23.27708	74.205	1909	43.6921
23.36402	74.205	1901	43.6005
23.45095	74.205	1858	43.1045
23.53788	74.205	1855	43.0697
23.62481	74.205	1788	42.2847
23.71174	74.205	1810	42.5441
23.79867	74.205	1740	41.7133
23.88561	74.205	1602	40.025
23.97254	74.205	1623	40.2865

24.05947	74.205	1656	40.694
24.1464	74.205	1575	39.6863
24.23333	74.205	1649	40.6079
24.32026	74.205	1603	40.0375
24.40719	74.205	1637	40.4599
24.49413	74.205	1657	40.7063
24.58106	74.205	1621	40.2616
24.66799	74.205	1676	40.939
24.75492	74.205	1751	41.845
24.84185	74.205	1908	43.6807
24.92878	74.205	1938	44.0227
25.01572	74.205	1900	43.589
25.10265	74.205	2175	46.6369
25.18958	74.205	2003	44.7549
25.27651	74.205	1998	44.699
25.36344	74.205	1745	41.7732
25.45037	74.205	1804	42.4735
25.5373	74.205	1797	42.391
25.62424	74.205	1825	42.72
25.71117	74.205	2119	46.0326
25.7981	74.205	2443	49.4267
25.88503	74.205	3142	56.0535
25.97196	74.205	3623	60.1914
26.05889	74.205	5081	71.2811
26.14583	74.205	6737	82.0792
26.23276	74.205	5987	77.3757
26.31969	74.205	3607	60.0583
26.40662	74.205	2606	51.049
26.49355	74.205	2250	47.4342
26.58048	74.205	2095	45.7712
26.66741	74.205	1937	44.0114
26.75435	74.205	1727	41.5572
26.84128	74.205	1717	41.4367
26.92821	74.205	1711	41.3642
27.01514	74.205	1767	42.0357
27.10207	74.205	1749	41.821
27.189	74.205	1685	41.0488
27.27593	74.205	1675	40.9268
27.36287	74.205	1748	41.8091
27.4498	74.205	1682	41.0122
27.53673	74.205	1756	41.9047

27.62366	74.205	1665	40.8044
27.71059	74.205	1645	40.5586
27.79752	74.205	1647	40.5832
27.88446	74.205	1642	40.5216
27.97139	74.205	1602	40.025
28.05832	74.205	1693	41.1461
28.14525	74.205	1554	39.4208
28.23218	74.205	1583	39.7869
28.31911	74.205	1561	39.5095
28.40604	74.205	1625	40.3113
28.49298	74.205	1665	40.8044
28.57991	74.205	1663	40.7799
28.66684	74.205	1775	42.1307
28.75377	74.205	1796	42.3792
28.8407	74.205	1790	42.3084
28.92763	74.205	1974	44.4297
29.01457	74.205	2220	47.1169
29.1015	74.205	2480	49.7996
29.18843	74.205	3209	56.648
29.27536	74.205	3799	61.636
29.36229	74.205	3677	60.6383
29.44922	74.205	3053	55.254
29.53615	74.205	2306	48.0208
29.62309	74.205	1878	43.3359
29.71002	74.205	1875	43.3013
29.79695	74.205	1974	44.4297
29.88388	74.205	2215	47.0638
29.97081	74.205	2445	49.4469
30.05774	74.205	2929	54.1202
30.14468	74.205	3661	60.5062
30.23161	74.205	4361	66.0379
30.31854	74.205	3699	60.8194
30.40547	74.205	2519	50.1896
30.4924	74.205	1934	43.9773
30.57933	74.205	1700	41.2311
30.66626	74.205	1593	39.9124
30.7532	74.205	1423	37.7227
30.84013	74.205	1457	38.1707
30.92706	74.205	1477	38.4318
31.01399	74.205	1515	38.923
31.10092	74.205	1560	39.4968

31.18785	74.205	1467	38.3014
31.27478	74.205	1551	39.3827
31.36172	74.205	1522	39.0128
31.44865	74.205	1423	37.7227
31.53558	74.205	1394	37.3363
31.62251	74.205	1405	37.4833
31.70944	74.205	1493	38.6394
31.79637	74.205	1527	39.0768
31.88331	74.205	1511	38.8716
31.97024	74.205	1501	38.7427
32.05717	74.205	1467	38.3014
32.1441	74.205	1540	39.2428
32.23103	74.205	1482	38.4968
32.31796	74.205	1417	37.6431
32.40489	74.205	1366	36.9594
32.49183	74.205	1409	37.5366
32.57876	74.205	1332	36.4966
32.66569	74.205	1396	37.3631
32.75262	74.205	1319	36.318
32.83955	74.205	1341	36.6197
32.92648	74.205	1299	36.0416
33.01342	74.205	1411	37.5633
33.10035	74.205	1386	37.229
33.18728	74.205	1439	37.9342
33.27421	74.205	1450	38.0789
33.36114	74.205	1370	37.0135
33.44807	74.205	1374	37.0675
33.535	74.205	1491	38.6135
33.62194	74.205	1541	39.2556
33.70887	74.205	1703	41.2674
33.7958	74.205	1866	43.1972
33.88273	74.205	2093	45.7493
33.96966	74.205	2048	45.2548
34.05659	74.205	1769	42.0595
34.14352	74.205	1654	40.6694
34.23046	74.205	1665	40.8044
34.31739	74.205	1817	42.6263
34.40432	74.205	2115	45.9891
34.49125	74.205	2455	49.548
34.57818	74.205	3044	55.1725
34.66511	74.205	3698	60.8112

34.75205	74.205	3604	60.0333
34.83898	74.205	2727	52.2207
34.92591	74.205	1960	44.2719
35.01284	74.205	1701	41.2432
35.09977	74.205	1423	37.7227
35.1867	74.205	1286	35.8608
35.27363	74.205	1252	35.3836
35.36057	74.205	1223	34.9714
35.4475	74.205	1242	35.242
35.53443	74.205	1164	34.1174
35.62136	74.205	1164	34.1174
35.70829	74.205	1198	34.6121
35.79522	74.205	1135	33.6898
35.88216	74.205	1130	33.6155
35.96909	74.205	1188	34.4674
36.05602	74.205	1204	34.6987
36.14295	74.205	1167	34.1614
36.22988	74.205	1155	33.9853
36.31681	74.205	1156	34
36.40374	74.205	1133	33.6601
36.49068	74.205	1147	33.8674
36.57761	74.205	1140	33.7639
36.66454	74.205	1186	34.4384
36.75147	74.205	1214	34.8425
36.8384	74.205	1314	36.2491
36.92533	74.205	1356	36.8239
37.01227	74.205	1406	37.4967
37.0992	74.205	1499	38.7169
37.18613	74.205	1634	40.4228
37.27306	74.205	1633	40.4104
37.35999	74.205	1423	37.7227
37.44692	74.205	1327	36.428
37.53385	74.205	1274	35.6931
37.62079	74.205	1393	37.3229
37.70772	74.205	1491	38.6135
37.79465	74.205	1695	41.1704
37.88158	74.205	1992	44.6318
37.96851	74.205	2245	47.3814
38.05544	74.205	2624	51.225
38.14237	74.205	2474	49.7393
38.22931	74.205	2010	44.833

38.31624	74.205	1593	39.9124
38.40317	74.205	1376	37.0945
38.4901	74.205	1169	34.1906
38.57703	74.205	1066	32.6497
38.66396	74.205	1071	32.7261
38.7509	74.205	1058	32.5269
38.83783	74.205	1060	32.5576
38.92476	74.205	1044	32.311
39.01169	74.205	1092	33.0454
39.09862	74.205	996	31.5595
39.18555	74.205	1022	31.9687
39.27248	74.205	1010	31.7805
39.35942	74.205	1058	32.5269
39.44635	74.205	1060	32.5576
39.53328	74.205	1052	32.4345
39.62021	74.205	1112	33.3467
39.70714	74.205	1101	33.1813
39.79407	74.205	1005	31.7017
39.88101	74.205	1066	32.6497
39.96794	74.205	1005	31.7017
40.05487	74.205	989	31.4484
40.1418	74.205	1023	31.9844
40.22873	74.205	997	31.5753
40.31566	74.205	1026	32.0312
40.40259	74.205	1027	32.0468
40.48953	74.205	1073	32.7567
40.57646	74.205	969	31.1288
40.66339	74.205	1053	32.45
40.75032	74.205	1047	32.3574
40.83725	74.205	1154	33.9706
40.92418	74.205	1123	33.5112
41.01112	74.205	1136	33.7046
41.09805	74.205	1119	33.4515
41.18498	74.205	1139	33.7491
41.27191	74.205	1040	32.249
41.35884	74.205	1150	33.9116
41.44577	74.205	1083	32.909
41.5327	74.205	1257	35.4542
41.61964	74.205	1294	35.9722
41.70657	74.205	1321	36.3456
41.7935	74.205	1273	35.6791

41.88043	74.205	1257	35.4542
41.96736	74.205	1128	33.5857
42.05429	74.205	1149	33.8969
42.14122	74.205	1200	34.641
42.22816	74.205	1348	36.7151
42.31509	74.205	1370	37.0135
42.40202	74.205	1515	38.923
42.48895	74.205	1478	38.4448
42.57588	74.205	1453	38.1182
42.66281	74.205	1312	36.2215
42.74975	74.205	1231	35.0856
42.83668	74.205	1114	33.3766
42.92361	74.205	1177	34.3074
43.01054	74.205	1216	34.8712
43.09747	74.205	1184	34.4093
43.1844	74.205	1193	34.5398
43.27133	74.205	1242	35.242
43.35827	74.205	1245	35.2846
43.4452	74.205	1212	34.8138
43.53213	74.205	1150	33.9116
43.61906	74.205	1154	33.9706
43.70599	74.205	1207	34.7419
43.79292	74.205	1181	34.3657
43.87986	74.205	1213	34.8281
43.96679	74.205	1121	33.4813
44.05372	74.205	1117	33.4215
44.14065	74.205	1043	32.2955
44.22758	74.205	1052	32.4345
44.31451	74.205	927	30.4467
44.40144	74.205	958	30.9516
44.48838	74.205	963	31.0322
44.57531	74.205	873	29.5466
44.66224	74.205	927	30.4467
44.74917	74.205	923	30.3809
44.8361	74.205	997	31.5753
44.92303	74.205	963	31.0322
45.00996	74.205	988	31.4325
45.0969	74.205	1084	32.9242
45.18383	74.205	1137	33.7194
45.27076	74.205	1073	32.7567
45.35769	74.205	996	31.5595

45.44462	74.205	974	31.209
45.53155	74.205	971	31.1609
45.61849	74.205	1041	32.2645
45.70542	74.205	1004	31.686
45.79235	74.205	1061	32.573
45.87928	74.205	1057	32.5115
45.96621	74.205	982	31.3369
46.05314	74.205	1023	31.9844
46.14007	74.205	924	30.3974
46.22701	74.205	953	30.8707
46.31394	74.205	888	29.7993
46.40087	74.205	957	30.9354
46.4878	74.205	920	30.3315
46.57473	74.205	884	29.7321
46.66166	74.205	980	31.305
46.7486	74.205	958	30.9516
46.83553	74.205	962	31.0161
46.92246	74.205	936	30.5941
47.00939	74.205	879	29.6479
47.09632	74.205	921	30.348
47.18325	74.205	952	30.8545
47.27018	74.205	938	30.6268
47.35712	74.205	995	31.5436
47.44405	74.205	1134	33.6749
47.53098	74.205	1276	35.7211
47.61791	74.205	1423	37.7227
47.70484	74.205	1552	39.3954
47.79177	74.205	1682	41.0122
47.87871	74.205	1570	39.6232
47.96564	74.205	1451	38.092
48.05257	74.205	1252	35.3836
48.1395	74.205	1147	33.8674
48.22643	74.205	1158	34.0294
48.31336	74.205	1095	33.0908
48.40029	74.205	960	30.9839
48.48723	74.205	840	28.9828
48.57416	74.205	868	29.4618
48.66109	74.205	852	29.189
48.74802	74.205	950	30.8221
48.83495	74.205	946	30.7571
48.92188	74.205	896	29.9333

49.00881	74.205	935	30.5778
49.09575	74.205	866	29.4279
49.18268	74.205	907	30.1164
49.26961	74.205	872	29.5296
49.35654	74.205	889	29.8161
49.44347	74.205	869	29.4788
49.5304	74.205	908	30.133
49.61734	74.205	927	30.4467
49.70427	74.205	917	30.282
49.7912	74.205	875	29.5804
49.87813	74.205	909	30.1496
49.96506	74.205	919	30.315
50.05199	74.205	968	31.1127
50.13892	74.205	901	30.0167
50.22586	74.205	901	30.0167
50.31279	74.205	867	29.4449
50.39972	74.205	894	29.8998
50.48665	74.205	892	29.8664
50.57358	74.205	900	30
50.66051	74.205	885	29.7489
50.74745	74.205	866	29.4279
50.83438	74.205	899	29.9833
50.92131	74.205	918	30.2985
51.00824	74.205	918	30.2985
51.09517	74.205	932	30.5287
51.1821	74.205	960	30.9839
51.26903	74.205	983	31.3528
51.35597	74.205	1005	31.7017
51.4429	74.205	1019	31.9218
51.52983	74.205	1115	33.3916
51.61676	74.205	1088	32.9848
51.70369	74.205	1146	33.8526
51.79062	74.205	1049	32.3883
51.87756	74.205	1034	32.1559
51.96449	74.205	1066	32.6497
52.05142	74.205	1102	33.1964
52.13835	74.205	1125	33.541
52.22528	74.205	1132	33.6452
52.31221	74.205	1096	33.1059
52.39914	74.205	1044	32.311
52.48608	74.205	1036	32.187

52.57301	74.205	1021	31.9531
52.65994	74.205	1027	32.0468
52.74687	74.205	1105	33.2415
52.8338	74.205	1040	32.249
52.92073	74.205	1014	31.8434
53.00766	74.205	1035	32.1714
53.0946	74.205	1029	32.078
53.18153	74.205	973	31.1929
53.26846	74.205	1008	31.749
53.35539	74.205	984	31.3688
53.44232	74.205	1010	31.7805
53.52925	74.205	932	30.5287
53.61619	74.205	957	30.9354
53.70312	74.205	913	30.2159
53.79005	74.205	940	30.6594
53.87698	74.205	914	30.2324
53.96391	74.205	918	30.2985
54.05084	74.205	955	30.9031
54.13777	74.205	892	29.8664
54.22471	74.205	850	29.1548
54.31164	74.205	878	29.6311
54.39857	74.205	900	30
54.4855	74.205	885	29.7489
54.57243	74.205	835	28.8964
54.65936	74.205	849	29.1376
54.7463	74.205	867	29.4449
54.83323	74.205	924	30.3974
54.92016	74.205	898	29.9666
55.00709	74.205	923	30.3809
55.09402	74.205	944	30.7246
55.18095	74.205	893	29.8831
55.26788	74.205	944	30.7246
55.35482	74.205	973	31.1929
55.44175	74.205	953	30.8707
55.52868	74.205	1121	33.4813
55.61561	74.205	1153	33.9559
55.70254	74.205	1207	34.7419
55.78947	74.205	1124	33.5261
55.8764	74.205	1085	32.9393
55.96334	74.205	1058	32.5269
56.05027	74.205	993	31.5119

56.1372	74.205	909	30.1496
56.22413	74.205	855	29.2404
56.31106	74.205	913	30.2159
56.39799	74.205	864	29.3939
56.48493	74.205	930	30.4959
56.57186	74.205	977	31.257
56.65879	74.205	1080	32.8634
56.74572	74.205	1083	32.909
56.83265	74.205	1118	33.4365
56.91958	74.205	1022	31.9687
57.00651	74.205	1050	32.4037
57.09345	74.205	971	31.1609
57.18038	74.205	1043	32.2955
57.26731	74.205	1023	31.9844
57.35424	74.205	986	31.4006
57.44117	74.205	1139	33.7491
57.5281	74.205	1049	32.3883
57.61504	74.205	1019	31.9218
57.70197	74.205	983	31.3528
57.7889	74.205	958	30.9516
57.87583	74.205	998	31.5911
57.96276	74.205	991	31.4802
58.04969	74.205	849	29.1376
58.13662	74.205	982	31.3369
58.22356	74.205	992	31.496
58.31049	74.205	1066	32.6497
58.39742	74.205	1144	33.8231
58.48435	74.205	1256	35.4401
58.57128	74.205	1351	36.756
58.65821	74.205	1368	36.9865
58.74515	74.205	1447	38.0395
58.83208	74.205	1333	36.5103
58.91901	74.205	1293	35.9583
59.00594	74.205	1106	33.2566
59.09287	74.205	1102	33.1964
59.1798	74.205	967	31.0966
59.26673	74.205	991	31.4802
59.35367	74.205	847	29.1033
59.4406	74.205	920	30.3315
59.52753	74.205	890	29.8329
59.61446	74.205	884	29.7321

59.70139	74.205	937	30.6105
59.78832	74.205	856	29.2575
59.87525	74.205	1008	31.749
59.96219	74.205	983	31.3528
60.04912	74.205	982	31.3369
60.13605	74.205	996	31.5595
60.22298	74.205	1066	32.6497
60.30991	74.205	1066	32.6497
60.39684	74.205	1130	33.6155
60.48378	74.205	1137	33.7194
60.57071	74.205	1074	32.7719
60.65764	74.205	1115	33.3916
60.74457	74.205	1134	33.6749
60.8315	74.205	1083	32.909
60.91843	74.205	1104	33.2265
61.00536	74.205	982	31.3369
61.0923	74.205	939	30.6431
61.17923	74.205	878	29.6311
61.26616	74.205	896	29.9333
61.35309	74.205	850	29.1548
61.44002	74.205	805	28.3725
61.52695	74.205	847	29.1033
61.61389	74.205	802	28.3196
61.70082	74.205	825	28.7228
61.78775	74.205	836	28.9137
61.87468	74.205	830	28.8097
61.96161	74.205	869	29.4788
62.04854	74.205	864	29.3939
62.13547	74.205	827	28.7576
62.22241	74.205	862	29.3598
62.30934	74.205	821	28.6531
62.39627	74.205	766	27.6767
62.4832	74.205	777	27.8747
62.57013	74.205	834	28.8791
62.65706	74.205	792	28.1425
62.744	74.205	840	28.9828
62.83093	74.205	837	28.931
62.91786	74.205	802	28.3196
63.00479	74.205	802	28.3196
63.09172	74.205	797	28.2312
63.17865	74.205	760	27.5681

63.26558	74.205	768	27.7128
63.35252	74.205	788	28.0713
63.43945	74.205	764	27.6405
63.52638	74.205	761	27.5862
63.61331	74.205	827	28.7576
63.70024	74.205	750	27.3861
63.78717	74.205	726	26.9444
63.8741	74.205	748	27.3496
63.96104	74.205	742	27.2397
64.04797	74.205	755	27.4773
64.1349	74.205	741	27.2213
64.22183	74.205	766	27.6767
64.30876	74.205	778	27.8927
64.39569	74.205	770	27.7489
64.48263	74.205	702	26.4953
64.56956	74.205	761	27.5862
64.65649	74.205	764	27.6405
64.74342	74.205	798	28.2489
64.83035	74.205	807	28.4077
64.91728	74.205	851	29.1719
65.00421	74.205	815	28.5482
65.09115	74.205	841	29
65.17808	74.205	877	29.6142
65.26501	74.205	905	30.0832
65.35194	74.205	930	30.4959
65.43887	74.205	918	30.2985
65.5258	74.205	959	30.9677
65.61274	74.205	929	30.4795
65.69967	74.205	906	30.0998
65.7866	74.205	893	29.8831
65.87353	74.205	816	28.5657
65.96046	74.205	808	28.4253
66.04739	74.205	809	28.4429
66.13432	74.205	766	27.6767
66.22126	74.205	769	27.7308
66.30819	74.205	739	27.1846
66.39512	74.205	757	27.5136
66.48205	74.205	771	27.7669
66.56898	74.205	709	26.6271
66.65591	74.205	703	26.5141
66.74284	74.205	737	27.1477

66.82978	74.205	692	26.3059
66.91671	74.205	739	27.1846
67.00364	74.205	694	26.3439
67.09057	74.205	638	25.2587
67.1775	74.205	779	27.9106
67.26443	74.205	725	26.9258
67.35137	74.205	720	26.8328
67.4383	74.205	677	26.0192
67.52523	74.205	699	26.4386
67.61216	74.205	782	27.9643
67.69909	74.205	738	27.1662
67.78602	74.205	728	26.9815
67.87295	74.205	853	29.2062
67.95989	74.205	811	28.4781
68.04682	74.205	909	30.1496
68.13375	74.205	871	29.5127
68.22068	74.205	817	28.5832
68.30761	74.205	825	28.7228
68.39454	74.205	787	28.0535
68.48148	74.205	776	27.8568
68.56841	74.205	728	26.9815
68.65534	74.205	741	27.2213
68.74227	74.205	717	26.7769
68.8292	74.205	730	27.0185
68.91613	74.205	708	26.6083
69.00306	74.205	677	26.0192
69.09	74.205	675	25.9808
69.17693	74.205	707	26.5895
69.26386	74.205	733	27.074
69.35079	74.205	671	25.9037
69.43772	74.205	735	27.1109
69.52465	74.205	709	26.6271
69.61159	74.205	732	27.0555
69.69852	74.205	656	25.6125
69.78545	74.205	718	26.7955
69.87238	74.205	702	26.4953
69.95931	74.205	717	26.7769
70.04624	74.205	700	26.4575
70.13317	74.205	699	26.4386
70.22011	74.205	741	27.2213
70.30704	74.205	704	26.533

70.39397	74.205	697	26.4008
70.4809	74.205	697	26.4008
70.56783	74.205	682	26.1151
70.65476	74.205	747	27.3313
70.74169	74.205	658	25.6515
70.82863	74.205	711	26.6646
70.91556	74.205	786	28.0357
71.00249	74.205	826	28.7402
71.08942	74.205	854	29.2233
71.17635	74.205	743	27.258
71.26328	74.205	749	27.3679
71.35022	74.205	795	28.1957
71.43715	74.205	713	26.7021
71.52408	74.205	716	26.7582
71.61101	74.205	721	26.8514
71.69794	74.205	700	26.4575
71.78487	74.205	688	26.2298
71.8718	74.205	704	26.533
71.95874	74.205	732	27.0555
72.04567	74.205	803	28.3373
72.1326	74.205	754	27.4591
72.21953	74.205	761	27.5862
72.30646	74.205	715	26.7395
72.39339	74.205	670	25.8844
72.48033	74.205	694	26.3439
72.56726	74.205	718	26.7955
72.65419	74.205	684	26.1534
72.74112	74.205	736	27.1293
72.82805	74.205	721	26.8514
72.91498	74.205	736	27.1293
73.00191	74.205	696	26.3818
73.08885	74.205	663	25.7488
73.17578	74.205	644	25.3772
73.26271	74.205	692	26.3059
73.34964	74.205	686	26.1916
73.43657	74.205	609	24.6779
73.5235	74.205	606	24.6171
73.61044	74.205	633	25.1595
73.69737	74.205	626	25.02
73.7843	74.205	694	26.3439
73.87123	74.205	657	25.632

73.95816	74.205	631	25.1197
74.04509	74.205	619	24.8797
74.13202	74.205	623	24.96
74.21896	74.205	626	25.02
74.30589	74.205	671	25.9037
74.39282	74.205	686	26.1916
74.47975	74.205	631	25.1197
74.56668	74.205	613	24.7588
74.65361	74.205	657	25.632
74.74054	74.205	635	25.1992
74.82748	74.205	638	25.2587
74.91441	74.205	625	25
75.00134	74.205	663	25.7488
75.08827	74.205	649	25.4755
75.1752	74.205	680	26.0768
75.26213	74.205	649	25.4755
75.34907	74.205	682	26.1151
75.436	74.205	616	24.8193
75.52293	74.205	613	24.7588
75.60986	74.205	603	24.5561
75.69679	74.205	602	24.5357
75.78372	74.205	566	23.7908
75.87065	74.205	542	23.2809
75.95759	74.205	643	25.3574
76.04452	74.205	612	24.7386
76.13145	74.205	562	23.7065
76.21838	74.205	558	23.622
76.30531	74.205	547	23.388
76.39224	74.205	614	24.779
76.47918	74.205	604	24.5764
76.56611	74.205	559	23.6432
76.65304	74.205	552	23.4947
76.73997	74.205	634	25.1794
76.8269	74.205	655	25.593
76.91383	74.205	619	24.8797
77.00076	74.205	616	24.8193
77.0877	74.205	648	25.4558
77.17463	74.205	624	24.98
77.26156	74.205	635	25.1992
77.34849	74.205	666	25.807
77.43542	74.205	652	25.5343

77.52235	74.205	624	24.98
77.60928	74.205	610	24.6982
77.69622	74.205	588	24.2487
77.78315	74.205	616	24.8193
77.87008	74.205	612	24.7386
77.95701	74.205	622	24.9399
78.04394	74.205	534	23.1084
78.13087	74.205	580	24.0832
78.21781	74.205	572	23.9165
78.30474	74.205	530	23.0217
78.39167	74.205	574	23.9583
78.4786	74.205	544	23.3238
78.56553	74.205	581	24.1039
78.65246	74.205	580	24.0832
78.73939	74.205	585	24.1868
78.82633	74.205	583	24.1454
78.91326	74.205	588	24.2487
79.00019	74.205	571	23.8956
79.08712	74.205	597	24.4336
79.17405	74.205	601	24.5153
79.26098	74.205	664	25.7682
79.34792	74.205	550	23.4521
79.43485	74.205	637	25.2389
79.52178	74.205	581	24.1039
79.60871	74.205	605	24.5967
79.69564	74.205	601	24.5153
79.78257	74.205	587	24.2281
79.8695	74.205	532	23.0651
79.95644	74.205	592	24.3311

[Measurement conditions]			
Sample identification		MnSnSi/AlPO-5	
Comment			
Anode material	Cu		
K-Alpha1 wavelength	1.540598		
K-Alpha2 wavelength	1.544426		
Ratio K-Alpha2/K-Alpha1	0.5		
Divergence slit	Fixed	0.76mm	
Monochromator used	NO		
Generator voltage	40		
Tube current	15		
File date and time	########		
Unit cell			
h k l	0 0 0		
Scan axis	Gonio		
Scan range	4.978	79.9999	
Scan step size	0.086932		
No. of points	863		
Scan type	CONTINUOUS		
Time per step	74.205		
[Scan points]			
Angle	TimePerStep	Intensity	ESD
5.021466	74.205	7160	84.6168
5.108397	74.205	6830	82.6438
5.195329	74.205	6464	80.399
5.28226	74.205	6226	78.905
5.369192	74.205	5963	77.2205
5.456123	74.205	5882	76.6942
5.543055	74.205	5535	74.3976
5.629986	74.205	5421	73.6274
5.716918	74.205	5289	72.7255
5.803849	74.205	5218	72.2357
5.890781	74.205	5259	72.519
5.977712	74.205	4958	70.4131
6.064644	74.205	4669	68.3301
6.151576	74.205	4273	65.3682
6.238507	74.205	3900	62.45
6.325439	74.205	3837	61.9435
6.41237	74.205	3831	61.8951

6.499302	74.205	3844	62
6.586233	74.205	3985	63.1269
6.673165	74.205	4046	63.6082
6.760096	74.205	4313	65.6734
6.847028	74.205	4998	70.6965
6.933959	74.205	5622	74.98
7.020891	74.205	7065	84.0536
7.107822	74.205	8939	94.5463
7.194754	74.205	12422	111.454
7.281685	74.205	18395	135.6282
7.368617	74.205	29071	170.5022
7.455548	74.205	49382	222.2206
7.54248	74.205	83811	289.5013
7.629411	74.205	80420	283.5842
7.716343	74.205	20747	144.0382
7.803274	74.205	6480	80.4984
7.890206	74.205	4998	70.6965
7.977137	74.205	4282	65.437
8.064069	74.205	3709	60.9016
8.151	74.205	3394	58.258
8.237932	74.205	3387	58.1979
8.324864	74.205	3307	57.5065
8.411795	74.205	3253	57.0351
8.498727	74.205	3152	56.1427
8.585658	74.205	3057	55.2901
8.67259	74.205	2933	54.1572
8.759521	74.205	2923	54.0648
8.846453	74.205	2908	53.9259
8.933384	74.205	2745	52.3927
9.020316	74.205	2823	53.1319
9.107247	74.205	2802	52.9339
9.194179	74.205	2827	53.1695
9.28111	74.205	2667	51.643
9.368042	74.205	2734	52.2877
9.454973	74.205	2864	53.5164
9.541905	74.205	2877	53.6377
9.628836	74.205	3256	57.0614
9.715768	74.205	3943	62.7933
9.802699	74.205	3802	61.6604

9.889631	74.205	2982	54.6077
9.976562	74.205	2589	50.8822
10.06349	74.205	2537	50.3686
10.15043	74.205	2457	49.5681
10.23736	74.205	2549	50.4876
10.32429	74.205	2545	50.448
10.41122	74.205	2273	47.676
10.49815	74.205	2260	47.5395
10.58508	74.205	2353	48.5077
10.67201	74.205	2254	47.4763
10.75895	74.205	2241	47.3392
10.84588	74.205	2269	47.634
10.93281	74.205	2264	47.5815
11.01974	74.205	2244	47.3709
11.10667	74.205	2294	47.8957
11.1936	74.205	2217	47.085
11.28054	74.205	2201	46.9148
11.36747	74.205	2246	47.392
11.4544	74.205	2143	46.2925
11.54133	74.205	2116	46
11.62826	74.205	2138	46.2385
11.71519	74.205	2273	47.676
11.80212	74.205	2102	45.8476
11.88906	74.205	2154	46.4112
11.97599	74.205	2107	45.9021
12.06292	74.205	2056	45.3431
12.14985	74.205	2101	45.8367
12.23678	74.205	2223	47.1487
12.32371	74.205	2184	46.7333
12.41064	74.205	2225	47.1699
12.49758	74.205	2421	49.2037
12.58451	74.205	2799	52.9056
12.67144	74.205	3473	58.9322
12.75837	74.205	5051	71.0704
12.8453	74.205	8394	91.6188
12.93223	74.205	14651	121.0413
13.01917	74.205	16836	129.7536
13.1061	74.205	7382	85.9186
13.19303	74.205	2956	54.3691

13.27996	74.205	2570	50.6952
13.36689	74.205	2277	47.7179
13.45382	74.205	2375	48.734
13.54075	74.205	2284	47.7912
13.62769	74.205	2183	46.7226
13.71462	74.205	2110	45.9347
13.80155	74.205	2106	45.8912
13.88848	74.205	1968	44.3621
13.97541	74.205	1994	44.6542
14.06234	74.205	2037	45.1331
14.14928	74.205	1982	44.5197
14.23621	74.205	2014	44.8776
14.32314	74.205	1923	43.852
14.41007	74.205	2119	46.0326
14.497	74.205	2004	44.7661
14.58393	74.205	2101	45.8367
14.67086	74.205	2434	49.3356
14.7578	74.205	3089	55.5788
14.84473	74.205	4594	67.7791
14.93166	74.205	7362	85.8021
15.01859	74.205	7580	87.0632
15.10552	74.205	3664	60.531
15.19245	74.205	2228	47.2017
15.27939	74.205	2003	44.7549
15.36632	74.205	1997	44.6878
15.45325	74.205	1945	44.1022
15.54018	74.205	1867	43.2088
15.62711	74.205	1821	42.6732
15.71404	74.205	1900	43.589
15.80097	74.205	1831	42.7902
15.88791	74.205	1803	42.4617
15.97484	74.205	1848	42.9884
16.06177	74.205	1827	42.7434
16.1487	74.205	1863	43.1625
16.23563	74.205	1983	44.5309
16.32256	74.205	2056	45.3431
16.40949	74.205	1975	44.441
16.49643	74.205	1855	43.0697
16.58336	74.205	1830	42.7785

16.67029	74.205	1713	41.3884
16.75722	74.205	1749	41.821
16.84415	74.205	1868	43.2204
16.93108	74.205	1867	43.2088
17.01802	74.205	1838	42.8719
17.10495	74.205	1827	42.7434
17.19188	74.205	1854	43.0581
17.27881	74.205	1755	41.8927
17.36574	74.205	1811	42.5558
17.45267	74.205	1794	42.3556
17.5396	74.205	1770	42.0714
17.62654	74.205	1793	42.3438
17.71347	74.205	1744	41.7612
17.8004	74.205	1827	42.7434
17.88733	74.205	1751	41.845
17.97426	74.205	1799	42.4146
18.06119	74.205	1873	43.2782
18.14813	74.205	1869	43.2319
18.23506	74.205	1924	43.8634
18.32199	74.205	1825	42.72
18.40892	74.205	1719	41.4608
18.49585	74.205	1789	42.2966
18.58278	74.205	1830	42.7785
18.66971	74.205	1874	43.2897
18.75665	74.205	1834	42.8252
18.84358	74.205	1978	44.4747
18.93051	74.205	2159	46.465
19.01744	74.205	2064	45.4313
19.10437	74.205	2147	46.3357
19.1913	74.205	2332	48.2908
19.27824	74.205	2431	49.3052
19.36517	74.205	2732	52.2685
19.4521	74.205	3223	56.7715
19.53903	74.205	5041	71
19.62596	74.205	10199	100.9901
19.71289	74.205	22399	149.663
19.79982	74.205	33415	182.7977
19.88676	74.205	18774	137.0182
19.97369	74.205	5619	74.96

20.06062	74.205	3128	55.9285
20.14755	74.205	3030	55.0454
20.23448	74.205	2901	53.8609
20.32141	74.205	2679	51.7591
20.40834	74.205	2661	51.5849
20.49528	74.205	2706	52.0192
20.58221	74.205	2878	53.647
20.66914	74.205	3009	54.8544
20.75607	74.205	3227	56.8067
20.843	74.205	3872	62.2254
20.92993	74.205	4490	67.0075
21.01687	74.205	6718	81.9634
21.1038	74.205	13822	117.567
21.19073	74.205	30982	176.017
21.27766	74.205	45224	212.6594
21.36459	74.205	26681	163.3432
21.45152	74.205	8226	90.6973
21.53845	74.205	4515	67.1937
21.62539	74.205	3706	60.8769
21.71232	74.205	3487	59.0508
21.79925	74.205	3186	56.4447
21.88618	74.205	3317	57.5934
21.97311	74.205	3419	58.4722
22.06004	74.205	3792	61.5792
22.14698	74.205	4803	69.3037
22.23391	74.205	8340	91.3236
22.32084	74.205	19536	139.7712
22.40777	74.205	44516	210.9882
22.4947	74.205	61639	248.272
22.58163	74.205	36627	191.3818
22.66856	74.205	12479	111.7094
22.7555	74.205	5299	72.7942
22.84243	74.205	3817	61.7819
22.92936	74.205	3183	56.4181
23.01629	74.205	2806	52.9717
23.10322	74.205	2757	52.5071
23.19015	74.205	2559	50.5866
23.27708	74.205	2527	50.2693
23.36402	74.205	2636	51.342

23.45095	74.205	2699	51.9519
23.53788	74.205	2629	51.2738
23.62481	74.205	2534	50.3389
23.71174	74.205	2422	49.2138
23.79867	74.205	2289	47.8435
23.88561	74.205	2303	47.9896
23.97254	74.205	2255	47.4868
24.05947	74.205	2313	48.0937
24.1464	74.205	2332	48.2908
24.23333	74.205	2365	48.6313
24.32026	74.205	2235	47.2758
24.40719	74.205	2326	48.2286
24.49413	74.205	2311	48.0729
24.58106	74.205	2337	48.3425
24.66799	74.205	2485	49.8498
24.75492	74.205	2895	53.8052
24.84185	74.205	3870	62.2093
24.92878	74.205	4746	68.8912
25.01572	74.205	3705	60.8687
25.10265	74.205	2660	51.5752
25.18958	74.205	2457	49.5681
25.27651	74.205	2354	48.518
25.36344	74.205	2428	49.2747
25.45037	74.205	2512	50.1199
25.5373	74.205	2613	51.1175
25.62424	74.205	2854	53.4228
25.71117	74.205	4118	64.1716
25.7981	74.205	8345	91.351
25.88503	74.205	17357	131.746
25.97196	74.205	21579	146.8979
26.05889	74.205	11679	108.0694
26.14583	74.205	4722	68.7168
26.23276	74.205	3244	56.9561
26.31969	74.205	3028	55.0273
26.40662	74.205	2929	54.1202
26.49355	74.205	2650	51.4782
26.58048	74.205	2407	49.0612
26.66741	74.205	2392	48.9081
26.75435	74.205	2239	47.3181

26.84128	74.205	2350	48.4768
26.92821	74.205	2425	49.2443
27.01514	74.205	2393	48.9183
27.10207	74.205	2329	48.2597
27.189	74.205	2437	49.366
27.27593	74.205	2476	49.7594
27.36287	74.205	2498	49.98
27.4498	74.205	2329	48.2597
27.53673	74.205	2209	47
27.62366	74.205	2124	46.0869
27.71059	74.205	2285	47.8017
27.79752	74.205	2318	48.1456
27.88446	74.205	2416	49.1528
27.97139	74.205	2332	48.2908
28.05832	74.205	2243	47.3603
28.14525	74.205	2300	47.9583
28.23218	74.205	2299	47.9479
28.31911	74.205	2411	49.1019
28.40604	74.205	2443	49.4267
28.49298	74.205	2617	51.1566
28.57991	74.205	2472	49.7192
28.66684	74.205	2363	48.6107
28.75377	74.205	2633	51.3128
28.8407	74.205	3009	54.8544
28.92763	74.205	4914	70.0999
29.01457	74.205	9085	95.3153
29.1015	74.205	12616	112.321
29.18843	74.205	9747	98.7269
29.27536	74.205	4789	69.2026
29.36229	74.205	2913	53.9722
29.44922	74.205	2634	51.3225
29.53615	74.205	2482	49.8197
29.62309	74.205	2481	49.8096
29.71002	74.205	2671	51.6817
29.79695	74.205	3563	59.6909
29.88388	74.205	6404	80.025
29.97081	74.205	11786	108.5633
30.05774	74.205	12257	110.7113
30.14468	74.205	6568	81.0432

30.23161	74.205	3366	58.0172
30.31854	74.205	2510	50.0999
30.40547	74.205	2322	48.1871
30.4924	74.205	2278	47.7284
30.57933	74.205	2144	46.3033
30.66626	74.205	2370	48.6826
30.7532	74.205	2248	47.4131
30.84013	74.205	2294	47.8957
30.92706	74.205	2411	49.1019
31.01399	74.205	2513	50.1298
31.10092	74.205	2594	50.9313
31.18785	74.205	2303	47.9896
31.27478	74.205	2425	49.2443
31.36172	74.205	2212	47.0319
31.44865	74.205	2143	46.2925
31.53558	74.205	2142	46.2817
31.62251	74.205	2165	46.5296
31.70944	74.205	2178	46.669
31.79637	74.205	2300	47.9583
31.88331	74.205	2320	48.1664
31.97024	74.205	2259	47.5289
32.05717	74.205	2174	46.6262
32.1441	74.205	2057	45.3542
32.23103	74.205	2090	45.7165
32.31796	74.205	2106	45.8912
32.40489	74.205	2055	45.3321
32.49183	74.205	1916	43.7721
32.57876	74.205	2025	45
32.66569	74.205	2075	45.5522
32.75262	74.205	2093	45.7493
32.83955	74.205	2080	45.607
32.92648	74.205	2044	45.2106
33.01342	74.205	2015	44.8888
33.10035	74.205	2099	45.8148
33.18728	74.205	1892	43.4971
33.27421	74.205	1924	43.8634
33.36114	74.205	1959	44.2606
33.44807	74.205	2144	46.3033
33.535	74.205	2774	52.6688

33.62194	74.205	4332	65.8179
33.70887	74.205	5467	73.9392
33.7958	74.205	4221	64.9692
33.88273	74.205	2720	52.1536
33.96966	74.205	2262	47.5605
34.05659	74.205	2212	47.0319
34.14352	74.205	2240	47.3286
34.23046	74.205	2646	51.4393
34.31739	74.205	4573	67.624
34.40432	74.205	9264	96.2497
34.49125	74.205	12443	111.5482
34.57818	74.205	8907	94.3769
34.66511	74.205	4229	65.0308
34.75205	74.205	2612	51.1077
34.83898	74.205	2111	45.9456
34.92591	74.205	1937	44.0114
35.01284	74.205	1919	43.8064
35.09977	74.205	1852	43.0349
35.1867	74.205	1846	42.9651
35.27363	74.205	1810	42.5441
35.36057	74.205	1845	42.9535
35.4475	74.205	1827	42.7434
35.53443	74.205	1768	42.0476
35.62136	74.205	1794	42.3556
35.70829	74.205	1824	42.7083
35.79522	74.205	1711	41.3642
35.88216	74.205	1692	41.1339
35.96909	74.205	1806	42.4971
36.05602	74.205	1821	42.6732
36.14295	74.205	1785	42.2493
36.22988	74.205	1755	41.8927
36.31681	74.205	1696	41.1825
36.40374	74.205	1714	41.4005
36.49068	74.205	1733	41.6293
36.57761	74.205	1797	42.391
36.66454	74.205	1778	42.1663
36.75147	74.205	2049	45.2659
36.8384	74.205	2507	50.07
36.92533	74.205	3622	60.1831

37.01227	74.205	4374	66.1362
37.0992	74.205	3280	57.2713
37.18613	74.205	2363	48.6107
37.27306	74.205	1987	44.5758
37.35999	74.205	1809	42.5323
37.44692	74.205	1936	44
37.53385	74.205	2124	46.0869
37.62079	74.205	2549	50.4876
37.70772	74.205	4416	66.453
37.79465	74.205	7931	89.0562
37.88158	74.205	9449	97.206
37.96851	74.205	6604	81.265
38.05544	74.205	3544	59.5315
38.14237	74.205	2193	46.8295
38.22931	74.205	1942	44.0681
38.31624	74.205	1836	42.8486
38.40317	74.205	1845	42.9535
38.4901	74.205	1721	41.4849
38.57703	74.205	1749	41.821
38.66396	74.205	1676	40.939
38.7509	74.205	1705	41.2916
38.83783	74.205	1688	41.0853
38.92476	74.205	1684	41.0366
39.01169	74.205	1611	40.1373
39.09862	74.205	1709	41.3401
39.18555	74.205	1588	39.8497
39.27248	74.205	1779	42.1782
39.35942	74.205	1788	42.2847
39.44635	74.205	1823	42.6966
39.53328	74.205	1692	41.1339
39.62021	74.205	1744	41.7612
39.70714	74.205	1692	41.1339
39.79407	74.205	1697	41.1947
39.88101	74.205	1702	41.2553
39.96794	74.205	1744	41.7612
40.05487	74.205	1733	41.6293
40.1418	74.205	1766	42.0238
40.22873	74.205	1796	42.3792
40.31566	74.205	1820	42.6615

40.40259	74.205	1732	41.6173
40.48953	74.205	1738	41.6893
40.57646	74.205	1871	43.2551
40.66339	74.205	2012	44.8553
40.75032	74.205	2258	47.5184
40.83725	74.205	2292	47.8748
40.92418	74.205	2052	45.299
41.01112	74.205	1828	42.7551
41.09805	74.205	1805	42.4853
41.18498	74.205	1776	42.1426
41.27191	74.205	1925	43.8748
41.35884	74.205	2493	49.93
41.44577	74.205	3250	57.0088
41.5327	74.205	3001	54.7814
41.61964	74.205	2381	48.7955
41.70657	74.205	1983	44.5309
41.7935	74.205	1820	42.6615
41.88043	74.205	1826	42.7317
41.96736	74.205	1964	44.317
42.05429	74.205	2373	48.7134
42.14122	74.205	3106	55.7315
42.22816	74.205	3507	59.2199
42.31509	74.205	3444	58.6856
42.40202	74.205	2858	53.4603
42.48895	74.205	2060	45.3872
42.57588	74.205	1880	43.359
42.66281	74.205	1767	42.0357
42.74975	74.205	1847	42.9767
42.83668	74.205	1888	43.4511
42.92361	74.205	2106	45.8912
43.01054	74.205	2743	52.3737
43.09747	74.205	3303	57.4717
43.1844	74.205	2980	54.5894
43.27133	74.205	2254	47.4763
43.35827	74.205	1943	44.0795
43.4452	74.205	2056	45.3431
43.53213	74.205	2364	48.621
43.61906	74.205	2764	52.5738
43.70599	74.205	2604	51.0294

43.79292	74.205	2465	49.6488
43.87986	74.205	2009	44.8219
43.96679	74.205	1920	43.8178
44.05372	74.205	1728	41.5692
44.14065	74.205	1617	40.2119
44.22758	74.205	1592	39.8999
44.31451	74.205	1620	40.2492
44.40144	74.205	1597	39.9625
44.48838	74.205	1632	40.398
44.57531	74.205	1670	40.8656
44.66224	74.205	1621	40.2616
44.74917	74.205	1728	41.5692
44.8361	74.205	1963	44.3058
44.92303	74.205	2214	47.0532
45.00996	74.205	2403	49.0204
45.0969	74.205	2214	47.0532
45.18383	74.205	1891	43.4856
45.27076	74.205	1693	41.1461
45.35769	74.205	1731	41.6053
45.44462	74.205	1747	41.7971
45.53155	74.205	1921	43.8292
45.61849	74.205	1988	44.587
45.70542	74.205	1973	44.4185
45.79235	74.205	1848	42.9884
45.87928	74.205	1818	42.638
45.96621	74.205	1766	42.0238
46.05314	74.205	1673	40.9023
46.14007	74.205	1644	40.5463
46.22701	74.205	1821	42.6732
46.31394	74.205	1930	43.9318
46.40087	74.205	2028	45.0333
46.4878	74.205	1752	41.8569
46.57473	74.205	1684	41.0366
46.66166	74.205	1611	40.1373
46.7486	74.205	1621	40.2616
46.83553	74.205	1619	40.2368
46.92246	74.205	1560	39.4968
47.00939	74.205	1646	40.5709
47.09632	74.205	1667	40.8289

47.18325	74.205	1735	41.6533
47.27018	74.205	1754	41.8808
47.35712	74.205	2185	46.744
47.44405	74.205	3060	55.3173
47.53098	74.205	4625	68.0074
47.61791	74.205	4834	69.527
47.70484	74.205	3894	62.4019
47.79177	74.205	2949	54.3047
47.87871	74.205	2187	46.7654
47.96564	74.205	2048	45.2548
48.05257	74.205	1864	43.1741
48.1395	74.205	1901	43.6005
48.22643	74.205	1854	43.0581
48.31336	74.205	1676	40.939
48.40029	74.205	1650	40.6202
48.48723	74.205	1558	39.4715
48.57416	74.205	1604	40.05
48.66109	74.205	1605	40.0625
48.74802	74.205	1612	40.1497
48.83495	74.205	1627	40.3361
48.92188	74.205	1627	40.3361
49.00881	74.205	1479	38.4578
49.09575	74.205	1559	39.4842
49.18268	74.205	1609	40.1123
49.26961	74.205	1745	41.7732
49.35654	74.205	1691	41.1218
49.44347	74.205	1767	42.0357
49.5304	74.205	1709	41.3401
49.61734	74.205	1683	41.0244
49.70427	74.205	1680	40.9878
49.7912	74.205	1651	40.6325
49.87813	74.205	1708	41.328
49.96506	74.205	1639	40.4846
50.05199	74.205	1619	40.2368
50.13892	74.205	1578	39.724
50.22586	74.205	1632	40.398
50.31279	74.205	1565	39.5601
50.39972	74.205	1564	39.5474
50.48665	74.205	1603	40.0375

50.57358	74.205	1601	40.0125
50.66051	74.205	1668	40.8412
50.74745	74.205	1827	42.7434
50.83438	74.205	1806	42.4971
50.92131	74.205	1841	42.9069
51.00824	74.205	1720	41.4729
51.09517	74.205	1844	42.9418
51.1821	74.205	2063	45.4203
51.26903	74.205	2560	50.5964
51.35597	74.205	2656	51.5364
51.4429	74.205	2415	49.1426
51.52983	74.205	2016	44.8999
51.61676	74.205	1841	42.9069
51.70369	74.205	1725	41.5331
51.79062	74.205	1788	42.2847
51.87756	74.205	2060	45.3872
51.96449	74.205	2493	49.93
52.05142	74.205	2648	51.4587
52.13835	74.205	2462	49.6185
52.22528	74.205	2158	46.4543
52.31221	74.205	1818	42.638
52.39914	74.205	1844	42.9418
52.48608	74.205	1959	44.2606
52.57301	74.205	2193	46.8295
52.65994	74.205	2095	45.7712
52.74687	74.205	1999	44.7102
52.8338	74.205	1816	42.6146
52.92073	74.205	1814	42.5911
53.00766	74.205	1812	42.5676
53.0946	74.205	1987	44.5758
53.18153	74.205	1908	43.6807
53.26846	74.205	1890	43.4741
53.35539	74.205	1789	42.2966
53.44232	74.205	1719	41.4608
53.52925	74.205	1626	40.3237
53.61619	74.205	1746	41.7852
53.70312	74.205	1855	43.0697
53.79005	74.205	1770	42.0714
53.87698	74.205	1731	41.6053

53.96391	74.205	1600	40
54.05084	74.205	1621	40.2616
54.13777	74.205	1617	40.2119
54.22471	74.205	1639	40.4846
54.31164	74.205	1602	40.025
54.39857	74.205	1565	39.5601
54.4855	74.205	1560	39.4968
54.57243	74.205	1641	40.5093
54.65936	74.205	1617	40.2119
54.7463	74.205	1571	39.6358
54.83323	74.205	1698	41.2068
54.92016	74.205	1695	41.1704
55.00709	74.205	1644	40.5463
55.09402	74.205	1635	40.4351
55.18095	74.205	1742	41.7373
55.26788	74.205	1965	44.3283
55.35482	74.205	2591	50.9019
55.44175	74.205	3078	55.4797
55.52868	74.205	3023	54.9818
55.61561	74.205	2643	51.4101
55.70254	74.205	2015	44.8888
55.78947	74.205	1825	42.72
55.8764	74.205	1670	40.8656
55.96334	74.205	1614	40.1746
56.05027	74.205	1622	40.2741
56.1372	74.205	1580	39.7492
56.22413	74.205	1543	39.281
56.31106	74.205	1672	40.8901
56.39799	74.205	1701	41.2432
56.48493	74.205	2098	45.8039
56.57186	74.205	2597	50.9608
56.65879	74.205	2564	50.636
56.74572	74.205	2360	48.5798
56.83265	74.205	2033	45.0888
56.91958	74.205	1805	42.4853
57.00651	74.205	1777	42.1545
57.09345	74.205	2067	45.4643
57.18038	74.205	2457	49.5681
57.26731	74.205	2777	52.6972

57.35424	74.205	2554	50.5371
57.44117	74.205	2296	47.9166
57.5281	74.205	1899	43.5775
57.61504	74.205	1758	41.9285
57.70197	74.205	1833	42.8135
57.7889	74.205	1759	41.9404
57.87583	74.205	1806	42.4971
57.96276	74.205	1771	42.0833
58.04969	74.205	1764	42
58.13662	74.205	2020	44.9444
58.22356	74.205	2311	48.0729
58.31049	74.205	2769	52.6213
58.39742	74.205	3322	57.6368
58.48435	74.205	4213	64.9076
58.57128	74.205	4926	70.1855
58.65821	74.205	4228	65.0231
58.74515	74.205	3383	58.1636
58.83208	74.205	2498	49.98
58.91901	74.205	1930	43.9318
59.00594	74.205	1680	40.9878
59.09287	74.205	1647	40.5832
59.1798	74.205	1692	41.1339
59.26673	74.205	1586	39.8246
59.35367	74.205	1583	39.7869
59.4406	74.205	1659	40.7308
59.52753	74.205	1757	41.9166
59.61446	74.205	1778	42.1663
59.70139	74.205	1797	42.391
59.78832	74.205	1896	43.5431
59.87525	74.205	2153	46.4004
59.96219	74.205	2535	50.3488
60.04912	74.205	2608	51.0686
60.13605	74.205	2286	47.8121
60.22298	74.205	2045	45.2217
60.30991	74.205	2034	45.0999
60.39684	74.205	2316	48.1248
60.48378	74.205	2796	52.8772
60.57071	74.205	3129	55.9375
60.65764	74.205	2908	53.9259

60.74457	74.205	2586	50.8527
60.8315	74.205	2150	46.3681
60.91843	74.205	1740	41.7133
61.00536	74.205	1620	40.2492
61.0923	74.205	1563	39.5348
61.17923	74.205	1638	40.4722
61.26616	74.205	1633	40.4104
61.35309	74.205	1509	38.8458
61.44002	74.205	1527	39.0768
61.52695	74.205	1681	41
61.61389	74.205	1613	40.1622
61.70082	74.205	1702	41.2553
61.78775	74.205	1827	42.7434
61.87468	74.205	1997	44.6878
61.96161	74.205	1968	44.3621
62.04854	74.205	1814	42.5911
62.13547	74.205	1643	40.5339
62.22241	74.205	1604	40.05
62.30934	74.205	1467	38.3014
62.39627	74.205	1543	39.281
62.4832	74.205	1625	40.3113
62.57013	74.205	1715	41.4126
62.65706	74.205	1813	42.5793
62.744	74.205	1868	43.2204
62.83093	74.205	1752	41.8569
62.91786	74.205	1693	41.1461
63.00479	74.205	1593	39.9124
63.09172	74.205	1494	38.6523
63.17865	74.205	1546	39.3192
63.26558	74.205	1434	37.8682
63.35252	74.205	1489	38.5876
63.43945	74.205	1511	38.8716
63.52638	74.205	1481	38.4838
63.61331	74.205	1435	37.8814
63.70024	74.205	1524	39.0384
63.78717	74.205	1566	39.5727
63.8741	74.205	1555	39.4335
63.96104	74.205	1529	39.1024
64.04797	74.205	1479	38.4578

64.1349	74.205	1441	37.9605
64.22183	74.205	1392	37.3095
64.30876	74.205	1444	38
64.39569	74.205	1428	37.7889
64.48263	74.205	1434	37.8682
64.56956	74.205	1531	39.128
64.65649	74.205	1583	39.7869
64.74342	74.205	1809	42.5323
64.83035	74.205	1904	43.6348
64.91728	74.205	1808	42.5206
65.00421	74.205	1924	43.8634
65.09115	74.205	1751	41.845
65.17808	74.205	1800	42.4264
65.26501	74.205	2143	46.2925
65.35194	74.205	2781	52.7352
65.43887	74.205	2903	53.8795
65.5258	74.205	2474	49.7393
65.61274	74.205	2263	47.571
65.69967	74.205	1822	42.6849
65.7866	74.205	1618	40.2244
65.87353	74.205	1449	38.0657
65.96046	74.205	1489	38.5876
66.04739	74.205	1512	38.8844
66.13432	74.205	1513	38.8973
66.22126	74.205	1450	38.0789
66.30819	74.205	1425	37.7492
66.39512	74.205	1390	37.2827
66.48205	74.205	1450	38.0789
66.56898	74.205	1460	38.2099
66.65591	74.205	1500	38.7298
66.74284	74.205	1583	39.7869
66.82978	74.205	1546	39.3192
66.91671	74.205	1480	38.4708
67.00364	74.205	1504	38.7814
67.09057	74.205	1430	37.8153
67.1775	74.205	1400	37.4166
67.26443	74.205	1442	37.9737
67.35137	74.205	1392	37.3095
67.4383	74.205	1435	37.8814

67.52523	74.205	1485	38.5357
67.61216	74.205	1570	39.6232
67.69909	74.205	1641	40.5093
67.78602	74.205	2150	46.3681
67.87295	74.205	2373	48.7134
67.95989	74.205	2421	49.2037
68.04682	74.205	2233	47.2546
68.13375	74.205	1987	44.5758
68.22068	74.205	1828	42.7551
68.30761	74.205	1740	41.7133
68.39454	74.205	1657	40.7063
68.48148	74.205	1584	39.7995
68.56841	74.205	1529	39.1024
68.65534	74.205	1445	38.0132
68.74227	74.205	1511	38.8716
68.8292	74.205	1431	37.8286
68.91613	74.205	1469	38.3275
69.00306	74.205	1448	38.0526
69.09	74.205	1391	37.2961
69.17693	74.205	1446	38.0263
69.26386	74.205	1506	38.8072
69.35079	74.205	1534	39.1663
69.43772	74.205	1468	38.3145
69.52465	74.205	1566	39.5727
69.61159	74.205	1685	41.0488
69.69852	74.205	1781	42.2019
69.78545	74.205	1767	42.0357
69.87238	74.205	1644	40.5463
69.95931	74.205	1607	40.0874
70.04624	74.205	1422	37.7094
70.13317	74.205	1435	37.8814
70.22011	74.205	1465	38.2753
70.30704	74.205	1471	38.3536
70.39397	74.205	1435	37.8814
70.4809	74.205	1456	38.1576
70.56783	74.205	1518	38.9615
70.65476	74.205	1554	39.4208
70.74169	74.205	1743	41.7493
70.82863	74.205	1976	44.4522

70.91556	74.205	2350	48.4768
71.00249	74.205	2271	47.655
71.08942	74.205	2094	45.7602
71.17635	74.205	1937	44.0114
71.26328	74.205	1659	40.7308
71.35022	74.205	1543	39.281
71.43715	74.205	1517	38.9487
71.52408	74.205	1425	37.7492
71.61101	74.205	1465	38.2753
71.69794	74.205	1470	38.3406
71.78487	74.205	1630	40.3733
71.8718	74.205	1805	42.4853
71.95874	74.205	2112	45.9565
72.04567	74.205	1991	44.6206
72.1326	74.205	1947	44.1248
72.21953	74.205	1846	42.9651
72.30646	74.205	1614	40.1746
72.39339	74.205	1638	40.4722
72.48033	74.205	1629	40.3609
72.56726	74.205	1662	40.7676
72.65419	74.205	1694	41.1582
72.74112	74.205	1673	40.9023
72.82805	74.205	1647	40.5832
72.91498	74.205	1624	40.2989
73.00191	74.205	1682	41.0122
73.08885	74.205	1620	40.2492
73.17578	74.205	1518	38.9615
73.26271	74.205	1589	39.8623
73.34964	74.205	1473	38.3797
73.43657	74.205	1405	37.4833
73.5235	74.205	1385	37.2156
73.61044	74.205	1440	37.9473
73.69737	74.205	1376	37.0945
73.7843	74.205	1444	38
73.87123	74.205	1459	38.1969
73.95816	74.205	1465	38.2753
74.04509	74.205	1597	39.9625
74.13202	74.205	1753	41.8688
74.21896	74.205	1776	42.1426

74.30589	74.205	1769	42.0595
74.39282	74.205	1757	41.9166
74.47975	74.205	1531	39.128
74.56668	74.205	1448	38.0526
74.65361	74.205	1424	37.7359
74.74054	74.205	1611	40.1373
74.82748	74.205	1710	41.3521
74.91441	74.205	1928	43.909
75.00134	74.205	1921	43.8292
75.08827	74.205	1812	42.5676
75.1752	74.205	1728	41.5692
75.26213	74.205	1546	39.3192
75.34907	74.205	1495	38.6652
75.436	74.205	1397	37.3765
75.52293	74.205	1374	37.0675
75.60986	74.205	1356	36.8239
75.69679	74.205	1429	37.8021
75.78372	74.205	1377	37.108
75.87065	74.205	1456	38.1576
75.95759	74.205	1559	39.4842
76.04452	74.205	1486	38.5487
76.13145	74.205	1492	38.6264
76.21838	74.205	1514	38.9102
76.30531	74.205	1517	38.9487
76.39224	74.205	1506	38.8072
76.47918	74.205	1490	38.6005
76.56611	74.205	1514	38.9102
76.65304	74.205	1506	38.8072
76.73997	74.205	1456	38.1576
76.8269	74.205	1647	40.5832
76.91383	74.205	1722	41.497
77.00076	74.205	1888	43.4511
77.0877	74.205	2144	46.3033
77.17463	74.205	2205	46.9574
77.26156	74.205	2039	45.1553
77.34849	74.205	1897	43.5546
77.43542	74.205	1816	42.6146
77.52235	74.205	1635	40.4351
77.60928	74.205	1424	37.7359

77.69622	74.205	1400	37.4166
77.78315	74.205	1391	37.2961
77.87008	74.205	1380	37.1484
77.95701	74.205	1365	36.9459
78.04394	74.205	1404	37.47
78.13087	74.205	1326	36.4143
78.21781	74.205	1477	38.4318
78.30474	74.205	1389	37.2693
78.39167	74.205	1395	37.3497
78.4786	74.205	1341	36.6197
78.56553	74.205	1397	37.3765
78.65246	74.205	1596	39.95
78.73939	74.205	1623	40.2865
78.82633	74.205	1841	42.9069
78.91326	74.205	1896	43.5431
79.00019	74.205	1800	42.4264
79.08712	74.205	1859	43.1161
79.17405	74.205	1722	41.497
79.26098	74.205	1580	39.7492
79.34792	74.205	1495	38.6652
79.43485	74.205	1432	37.8418
79.52178	74.205	1392	37.3095
79.60871	74.205	1416	37.6298
79.69564	74.205	1498	38.704
79.78257	74.205	1621	40.2616
79.8695	74.205	1626	40.3237
79.95644	74.205	1690	41.1096

Sample identification	Fe/AlPO-5		
Comment			
Anode material	Cu		
K-Alpha1 wavelength	1.540598		
K-Alpha2 wavelength	1.544426		
Ratio K-Alpha2/K-Alpha1	0.5		
Divergence slit	Fixed	0.76mm	
Monochromator used	NO		
Generator voltage	40		
Tube current	15		
File date and time	########		
Unit cell			
h k l	0 0 0		
Scan axis	Gonio		
Scan range	4.978	79.9999	
Scan step size	0.086932		
No. of points	863		
Scan type	CONTINUOUS		
Time per step	74.205		
[Scan points]			
Angle	TimePerStep	Intensity	ESD
5.021466	74.205	7731	87.9261
5.108397	74.205	7543	86.8504
5.195329	74.205	7306	85.4751
5.28226	74.205	6997	83.6481
5.369192	74.205	6655	81.5782
5.456123	74.205	6382	79.8874
5.543055	74.205	6271	79.1896
5.629986	74.205	5811	76.2299
5.716918	74.205	5952	77.1492
5.803849	74.205	5714	75.591
5.890781	74.205	5543	74.4513
5.977712	74.205	5366	73.253
6.064644	74.205	4946	70.3278
6.151576	74.205	4545	67.4166

6.238507	74.205	4171	64.5833
6.325439	74.205	4016	63.3719
6.41237	74.205	3886	62.3378
6.499302	74.205	3780	61.4817
6.586233	74.205	3673	60.6053
6.673165	74.205	3608	60.0666
6.760096	74.205	3649	60.407
6.847028	74.205	3685	60.7042
6.933959	74.205	4021	63.4114
7.020891	74.205	4089	63.9453
7.107822	74.205	4655	68.2276
7.194754	74.205	5223	72.2703
7.281685	74.205	6657	81.5904
7.368617	74.205	9383	96.8659
7.455548	74.205	12008	109.581
7.54248	74.205	15800	125.6981
7.629411	74.205	23596	153.6099
7.716343	74.205	32682	180.7816
7.803274	74.205	12758	112.9513
7.890206	74.205	4234	65.0692
7.977137	74.205	3527	59.3886
8.064069	74.205	3219	56.7362
8.151	74.205	2856	53.4416
8.237932	74.205	2811	53.0189
8.324864	74.205	2771	52.6403
8.411795	74.205	2611	51.0979
8.498727	74.205	2566	50.6557
8.585658	74.205	2673	51.7011
8.67259	74.205	2570	50.6952
8.759521	74.205	2461	49.6085
8.846453	74.205	2499	49.99
8.933384	74.205	2460	49.5984
9.020316	74.205	2455	49.548
9.107247	74.205	2420	49.1935
9.194179	74.205	2417	49.163
9.28111	74.205	2502	50.02
9.368042	74.205	2379	48.775
9.454973	74.205	2372	48.7032
9.541905	74.205	2450	49.4975
9.628836	74.205	2355	48.5283
9.715768	74.205	2391	48.8979

9.802699	74.205	2303	47.9896
9.889631	74.205	2267	47.613
9.976562	74.205	2200	46.9042
10.06349	74.205	2213	47.0425
10.15043	74.205	2189	46.7868
10.23736	74.205	2324	48.2079
10.32429	74.205	2205	46.9574
10.41122	74.205	2227	47.1911
10.49815	74.205	2225	47.1699
10.58508	74.205	2176	46.6476
10.67201	74.205	2249	47.4236
10.75895	74.205	2194	46.8402
10.84588	74.205	2192	46.8188
10.93281	74.205	2189	46.7868
11.01974	74.205	2127	46.1194
11.10667	74.205	2190	46.7974
11.1936	74.205	2233	47.2546
11.28054	74.205	2137	46.2277
11.36747	74.205	2184	46.7333
11.4544	74.205	2229	47.2123
11.54133	74.205	2167	46.551
11.62826	74.205	2024	44.9889
11.71519	74.205	2089	45.7056
11.80212	74.205	2080	45.607
11.88906	74.205	2133	46.1844
11.97599	74.205	2208	46.9894
12.06292	74.205	2170	46.5833
12.14985	74.205	2153	46.4004
12.23678	74.205	2104	45.8694
12.32371	74.205	2200	46.9042
12.41064	74.205	2228	47.2017
12.49758	74.205	2276	47.7074
12.58451	74.205	2381	48.7955
12.67144	74.205	2456	49.558
12.75837	74.205	2770	52.6308
12.8453	74.205	3364	58
12.93223	74.205	3734	61.1065
13.01917	74.205	5072	71.218
13.1061	74.205	6520	80.7465
13.19303	74.205	4698	68.542
13.27996	74.205	2643	51.4101

13.36689	74.205	2419	49.1833
13.45382	74.205	2312	48.0833
13.54075	74.205	2183	46.7226
13.62769	74.205	2316	48.1248
13.71462	74.205	2370	48.6826
13.80155	74.205	2201	46.9148
13.88848	74.205	2257	47.5079
13.97541	74.205	2194	46.8402
14.06234	74.205	2131	46.1628
14.14928	74.205	2144	46.3033
14.23621	74.205	2196	46.8615
14.32314	74.205	2211	47.0213
14.41007	74.205	2172	46.6047
14.497	74.205	2170	46.5833
14.58393	74.205	2315	48.1144
14.67086	74.205	2329	48.2597
14.7578	74.205	2483	49.8297
14.84473	74.205	2690	51.8652
14.93166	74.205	3030	55.0454
15.01859	74.205	3494	59.1101
15.10552	74.205	3900	62.45
15.19245	74.205	3030	55.0454
15.27939	74.205	2346	48.4355
15.36632	74.205	2326	48.2286
15.45325	74.205	2274	47.6865
15.54018	74.205	2202	46.9255
15.62711	74.205	2255	47.4868
15.71404	74.205	2269	47.634
15.80097	74.205	2263	47.571
15.88791	74.205	2287	47.8226
15.97484	74.205	2242	47.3498
16.06177	74.205	2322	48.1871
16.1487	74.205	2331	48.2804
16.23563	74.205	2370	48.6826
16.32256	74.205	2270	47.6445
16.40949	74.205	2284	47.7912
16.49643	74.205	2264	47.5815
16.58336	74.205	2271	47.655
16.67029	74.205	2292	47.8748
16.75722	74.205	2312	48.0833
16.84415	74.205	2296	47.9166

16.93108	74.205	2327	48.239
17.01802	74.205	2403	49.0204
17.10495	74.205	2403	49.0204
17.19188	74.205	2371	48.6929
17.27881	74.205	2427	49.2646
17.36574	74.205	2462	49.6185
17.45267	74.205	2398	48.9694
17.5396	74.205	2435	49.3457
17.62654	74.205	2448	49.4773
17.71347	74.205	2457	49.5681
17.8004	74.205	2431	49.3052
17.88733	74.205	2458	49.5782
17.97426	74.205	2471	49.7092
18.06119	74.205	2556	50.5569
18.14813	74.205	2499	49.99
18.23506	74.205	2589	50.8822
18.32199	74.205	2547	50.4678
18.40892	74.205	2557	50.5668
18.49585	74.205	2473	49.7293
18.58278	74.205	2572	50.7149
18.66971	74.205	2696	51.923
18.75665	74.205	2565	50.6458
18.84358	74.205	2712	52.0769
18.93051	74.205	2904	53.8888
19.01744	74.205	2859	53.4696
19.10437	74.205	2685	51.817
19.1913	74.205	2805	52.9623
19.27824	74.205	2942	54.2402
19.36517	74.205	2926	54.0925
19.4521	74.205	3179	56.3826
19.53903	74.205	3825	61.8466
19.62596	74.205	5096	71.3863
19.71289	74.205	6699	81.8474
19.79982	74.205	9237	96.1093
19.88676	74.205	11777	108.5219
19.97369	74.205	9209	95.9635
20.06062	74.205	4779	69.1303
20.14755	74.205	3690	60.7454
20.23448	74.205	3518	59.3127
20.32141	74.205	3456	58.7878
20.40834	74.205	3400	58.3095

20.49528	74.205	3145	56.0803
20.58221	74.205	3159	56.205
20.66914	74.205	3195	56.5243
20.75607	74.205	3445	58.6941
20.843	74.205	3695	60.7865
20.92993	74.205	3948	62.8331
21.01687	74.205	4697	68.5347
21.1038	74.205	6038	77.7046
21.19073	74.205	7610	87.2353
21.27766	74.205	10458	102.2644
21.36459	74.205	13460	116.0172
21.45152	74.205	11967	109.3938
21.53845	74.205	6506	80.6598
21.62539	74.205	4564	67.5574
21.71232	74.205	4032	63.498
21.79925	74.205	3816	61.7738
21.88618	74.205	3742	61.1719
21.97311	74.205	3969	63
22.06004	74.205	4012	63.3404
22.14698	74.205	4481	66.9403
22.23391	74.205	5584	74.7262
22.32084	74.205	7900	88.8819
22.40777	74.205	11554	107.4895
22.4947	74.205	16223	127.3695
22.58163	74.205	20004	141.4355
22.66856	74.205	15557	124.7277
22.7555	74.205	8256	90.8625
22.84243	74.205	5136	71.6659
22.92936	74.205	4413	66.4304
23.01629	74.205	4051	63.6475
23.10322	74.205	3771	61.4085
23.19015	74.205	3600	60
23.27708	74.205	3726	61.041
23.36402	74.205	3741	61.1637
23.45095	74.205	3684	60.696
23.53788	74.205	3743	61.1801
23.62481	74.205	3616	60.1332
23.71174	74.205	3466	58.8727
23.79867	74.205	3485	59.0339
23.88561	74.205	3441	58.66
23.97254	74.205	3556	59.6322

24.05947	74.205	3451	58.7452
24.1464	74.205	3599	59.9917
24.23333	74.205	3567	59.7244
24.32026	74.205	3485	59.0339
24.40719	74.205	3387	58.1979
24.49413	74.205	3466	58.8727
24.58106	74.205	3515	59.2874
24.66799	74.205	3597	59.975
24.75492	74.205	3693	60.7701
24.84185	74.205	3701	60.8358
24.92878	74.205	3877	62.2656
25.01572	74.205	3997	63.2218
25.10265	74.205	3984	63.1189
25.18958	74.205	3678	60.6465
25.27651	74.205	3568	59.7327
25.36344	74.205	3492	59.0931
25.45037	74.205	3558	59.649
25.5373	74.205	3572	59.7662
25.62424	74.205	3787	61.5386
25.71117	74.205	4206	64.8537
25.7981	74.205	5251	72.4638
25.88503	74.205	6556	80.9691
25.97196	74.205	8150	90.2774
26.05889	74.205	9016	94.9526
26.14583	74.205	6934	83.2706
26.23276	74.205	4705	68.593
26.31969	74.205	4225	65
26.40662	74.205	3951	62.857
26.49355	74.205	3892	62.3859
26.58048	74.205	3628	60.2329
26.66741	74.205	3496	59.127
26.75435	74.205	3364	58
26.84128	74.205	3382	58.155
26.92821	74.205	3421	58.4893
27.01514	74.205	3357	57.9396
27.10207	74.205	3382	58.155
27.189	74.205	3439	58.643
27.27593	74.205	3442	58.6686
27.36287	74.205	3424	58.515
27.4498	74.205	3481	59
27.53673	74.205	3380	58.1378

27.62366	74.205	3184	56.4269
27.71059	74.205	3262	57.1139
27.79752	74.205	3321	57.6281
27.88446	74.205	3315	57.576
27.97139	74.205	3418	58.4637
28.05832	74.205	3348	57.8619
28.14525	74.205	3230	56.8331
28.23218	74.205	3302	57.463
28.31911	74.205	3319	57.6108
28.40604	74.205	3390	58.2237
28.49298	74.205	3390	58.2237
28.57991	74.205	3438	58.6345
28.66684	74.205	3330	57.7062
28.75377	74.205	3472	58.9237
28.8407	74.205	3379	58.1292
28.92763	74.205	3897	62.426
29.01457	74.205	4580	67.6757
29.1015	74.205	5321	72.9452
29.18843	74.205	6008	77.5113
29.27536	74.205	5537	74.411
29.36229	74.205	4262	65.284
29.44922	74.205	3558	59.649
29.53615	74.205	3492	59.0931
29.62309	74.205	3322	57.6368
29.71002	74.205	3460	58.8218
29.79695	74.205	3683	60.6877
29.88388	74.205	4388	66.242
29.97081	74.205	5308	72.856
30.05774	74.205	6296	79.3473
30.14468	74.205	6276	79.2212
30.23161	74.205	4823	69.4478
30.31854	74.205	3660	60.4979
30.40547	74.205	3277	57.2451
30.4924	74.205	3166	56.2672
30.57933	74.205	3191	56.4889
30.66626	74.205	3075	55.4527
30.7532	74.205	3063	55.3444
30.84013	74.205	3202	56.5862
30.92706	74.205	3076	55.4617
31.01399	74.205	3124	55.8928
31.10092	74.205	3153	56.1516

31.18785	74.205	3074	55.4437
31.27478	74.205	2935	54.1756
31.36172	74.205	2957	54.3783
31.44865	74.205	3019	54.9454
31.53558	74.205	2984	54.626
31.62251	74.205	3018	54.9363
31.70944	74.205	3018	54.9363
31.79637	74.205	3201	56.5774
31.88331	74.205	3115	55.8122
31.97024	74.205	3251	57.0175
32.05717	74.205	3061	55.3263
32.1441	74.205	2978	54.5711
32.23103	74.205	2931	54.1387
32.31796	74.205	2906	53.9073
32.40489	74.205	2830	53.1977
32.49183	74.205	2864	53.5164
32.57876	74.205	2763	52.5642
32.66569	74.205	2852	53.4041
32.75262	74.205	2791	52.8299
32.83955	74.205	2929	54.1202
32.92648	74.205	2973	54.5252
33.01342	74.205	2981	54.5985
33.10035	74.205	2994	54.7175
33.18728	74.205	2978	54.5711
33.27421	74.205	2924	54.074
33.36114	74.205	2881	53.6749
33.44807	74.205	3049	55.2178
33.535	74.205	3194	56.5155
33.62194	74.205	3366	58.0172
33.70887	74.205	3687	60.7207
33.7958	74.205	3986	63.1348
33.88273	74.205	3677	60.6383
33.96966	74.205	3323	57.6455
34.05659	74.205	3176	56.356
34.14352	74.205	2992	54.6992
34.23046	74.205	3268	57.1664
34.31739	74.205	3822	61.8223
34.40432	74.205	4664	68.2935
34.49125	74.205	5616	74.94
34.57818	74.205	6006	77.4984
34.66511	74.205	5190	72.0417

34.75205	74.205	3780	61.4817
34.83898	74.205	3018	54.9363
34.92591	74.205	2998	54.754
35.01284	74.205	2854	53.4228
35.09977	74.205	2793	52.8488
35.1867	74.205	2854	53.4228
35.27363	74.205	2803	52.9434
35.36057	74.205	2751	52.45
35.4475	74.205	2775	52.6783
35.53443	74.205	2570	50.6952
35.62136	74.205	2787	52.792
35.70829	74.205	2789	52.811
35.79522	74.205	2703	51.9904
35.88216	74.205	2667	51.643
35.96909	74.205	2700	51.9615
36.05602	74.205	2800	52.915
36.14295	74.205	2708	52.0384
36.22988	74.205	2678	51.7494
36.31681	74.205	2619	51.1762
36.40374	74.205	2668	51.6527
36.49068	74.205	2627	51.2543
36.57761	74.205	2641	51.3907
36.66454	74.205	2732	52.2685
36.75147	74.205	2750	52.4404
36.8384	74.205	2920	54.037
36.92533	74.205	3059	55.3082
37.01227	74.205	3350	57.8792
37.0992	74.205	3497	59.1354
37.18613	74.205	3121	55.8659
37.27306	74.205	2944	54.2586
37.35999	74.205	2730	52.2494
37.44692	74.205	2831	53.2071
37.53385	74.205	2760	52.5357
37.62079	74.205	2971	54.5069
37.70772	74.205	3286	57.3236
37.79465	74.205	3803	61.6685
37.88158	74.205	4537	67.3573
37.96851	74.205	4898	69.9857
38.05544	74.205	4378	66.1665
38.14237	74.205	3564	59.6992
38.22931	74.205	2930	54.1295

38.31624	74.205	2727	52.2207
38.40317	74.205	2719	52.144
38.4901	74.205	2535	50.3488
38.57703	74.205	2584	50.8331
38.66396	74.205	2598	50.9706
38.7509	74.205	2564	50.636
38.83783	74.205	2586	50.8527
38.92476	74.205	2620	51.1859
39.01169	74.205	2524	50.2394
39.09862	74.205	2532	50.319
39.18555	74.205	2555	50.547
39.27248	74.205	2578	50.774
39.35942	74.205	2620	51.1859
39.44635	74.205	2665	51.6236
39.53328	74.205	2559	50.5866
39.62021	74.205	2776	52.6878
39.70714	74.205	2649	51.4684
39.79407	74.205	2591	50.9019
39.88101	74.205	2637	51.3517
39.96794	74.205	2540	50.3984
40.05487	74.205	2596	50.951
40.1418	74.205	2604	51.0294
40.22873	74.205	2741	52.3546
40.31566	74.205	2807	52.9811
40.40259	74.205	2617	51.1566
40.48953	74.205	2659	51.5655
40.57646	74.205	2628	51.264
40.66339	74.205	2700	51.9615
40.75032	74.205	2639	51.3712
40.83725	74.205	2681	51.7784
40.92418	74.205	2683	51.7977
41.01112	74.205	2635	51.3323
41.09805	74.205	2588	50.8724
41.18498	74.205	2528	50.2792
41.27191	74.205	2623	51.2152
41.35884	74.205	2777	52.6972
41.44577	74.205	2979	54.5802
41.5327	74.205	3012	54.8817
41.61964	74.205	2981	54.5985
41.70657	74.205	2831	53.2071
41.7935	74.205	2631	51.2933

41.88043	74.205	2609	51.0784
41.96736	74.205	2582	50.8134
42.05429	74.205	2857	53.4509
42.14122	74.205	3024	54.9909
42.22816	74.205	3201	56.5774
42.31509	74.205	3296	57.4108
42.40202	74.205	3302	57.463
42.48895	74.205	3034	55.0818
42.57588	74.205	2844	53.3292
42.66281	74.205	2649	51.4684
42.74975	74.205	2684	51.8073
42.83668	74.205	2553	50.5272
42.92361	74.205	2700	51.9615
43.01054	74.205	2763	52.5642
43.09747	74.205	2783	52.7541
43.1844	74.205	3010	54.8635
43.27133	74.205	2944	54.2586
43.35827	74.205	2778	52.7067
43.4452	74.205	2639	51.3712
43.53213	74.205	2776	52.6878
43.61906	74.205	2723	52.1824
43.70599	74.205	2810	53.0094
43.79292	74.205	2795	52.8678
43.87986	74.205	2732	52.2685
43.96679	74.205	2727	52.2207
44.05372	74.205	2621	51.1957
44.14065	74.205	2548	50.4777
44.22758	74.205	2602	51.0098
44.31451	74.205	2364	48.621
44.40144	74.205	2547	50.4678
44.48838	74.205	2409	49.0816
44.57531	74.205	2597	50.9608
44.66224	74.205	2489	49.8899
44.74917	74.205	2637	51.3517
44.8361	74.205	2577	50.7642
44.92303	74.205	2594	50.9313
45.00996	74.205	2644	51.4198
45.0969	74.205	2650	51.4782
45.18383	74.205	2658	51.5558
45.27076	74.205	2580	50.7937
45.35769	74.205	2441	49.4065

45.44462	74.205	2399	48.9796
45.53155	74.205	2568	50.6754
45.61849	74.205	2660	51.5752
45.70542	74.205	2545	50.448
45.79235	74.205	2709	52.0481
45.87928	74.205	2569	50.6853
45.96621	74.205	2570	50.6952
46.05314	74.205	2524	50.2394
46.14007	74.205	2501	50.01
46.22701	74.205	2533	50.3289
46.31394	74.205	2477	49.7695
46.40087	74.205	2545	50.448
46.4878	74.205	2580	50.7937
46.57473	74.205	2441	49.4065
46.66166	74.205	2456	49.558
46.7486	74.205	2496	49.96
46.83553	74.205	2392	48.9081
46.92246	74.205	2479	49.7896
47.00939	74.205	2479	49.7896
47.09632	74.205	2446	49.4571
47.18325	74.205	2474	49.7393
47.27018	74.205	2550	50.4975
47.35712	74.205	2787	52.792
47.44405	74.205	2960	54.4059
47.53098	74.205	3317	57.5934
47.61791	74.205	3539	59.4895
47.70484	74.205	3336	57.7581
47.79177	74.205	3216	56.7098
47.87871	74.205	2967	54.4702
47.96564	74.205	2767	52.6023
48.05257	74.205	2782	52.7447
48.1395	74.205	2698	51.9423
48.22643	74.205	2609	51.0784
48.31336	74.205	2519	50.1896
48.40029	74.205	2431	49.3052
48.48723	74.205	2336	48.3322
48.57416	74.205	2390	48.8876
48.66109	74.205	2392	48.9081
48.74802	74.205	2420	49.1935
48.83495	74.205	2349	48.4665
48.92188	74.205	2352	48.4974

49.00881	74.205	2395	48.9387
49.09575	74.205	2358	48.5592
49.18268	74.205	2406	49.051
49.26961	74.205	2508	50.0799
49.35654	74.205	2543	50.4282
49.44347	74.205	2461	49.6085
49.5304	74.205	2508	50.0799
49.61734	74.205	2425	49.2443
49.70427	74.205	2445	49.4469
49.7912	74.205	2445	49.4469
49.87813	74.205	2348	48.4562
49.96506	74.205	2389	48.8774
50.05199	74.205	2474	49.7393
50.13892	74.205	2298	47.9375
50.22586	74.205	2304	48
50.31279	74.205	2287	47.8226
50.39972	74.205	2378	48.7647
50.48665	74.205	2428	49.2747
50.57358	74.205	2346	48.4355
50.66051	74.205	2378	48.7647
50.74745	74.205	2339	48.3632
50.83438	74.205	2354	48.518
50.92131	74.205	2437	49.366
51.00824	74.205	2433	49.3254
51.09517	74.205	2505	50.05
51.1821	74.205	2635	51.3323
51.26903	74.205	2662	51.5946
51.35597	74.205	2696	51.923
51.4429	74.205	2648	51.4587
51.52983	74.205	2519	50.1896
51.61676	74.205	2544	50.4381
51.70369	74.205	2451	49.5076
51.79062	74.205	2416	49.1528
51.87756	74.205	2558	50.5767
51.96449	74.205	2621	51.1957
52.05142	74.205	2625	51.2348
52.13835	74.205	2721	52.1632
52.22528	74.205	2691	51.8748
52.31221	74.205	2568	50.6754
52.39914	74.205	2426	49.2544
52.48608	74.205	2418	49.1732

52.57301	74.205	2563	50.6261
52.65994	74.205	2595	50.9411
52.74687	74.205	2596	50.951
52.8338	74.205	2517	50.1697
52.92073	74.205	2422	49.2138
53.00766	74.205	2509	50.0899
53.0946	74.205	2355	48.5283
53.18153	74.205	2512	50.1199
53.26846	74.205	2448	49.4773
53.35539	74.205	2451	49.5076
53.44232	74.205	2420	49.1935
53.52925	74.205	2388	48.8672
53.61619	74.205	2488	49.8799
53.70312	74.205	2367	48.6518
53.79005	74.205	2433	49.3254
53.87698	74.205	2395	48.9387
53.96391	74.205	2321	48.1768
54.05084	74.205	2379	48.775
54.13777	74.205	2308	48.0416
54.22471	74.205	2340	48.3735
54.31164	74.205	2319	48.156
54.39857	74.205	2354	48.518
54.4855	74.205	2373	48.7134
54.57243	74.205	2380	48.7852
54.65936	74.205	2387	48.8569
54.7463	74.205	2369	48.6724
54.83323	74.205	2362	48.6004
54.92016	74.205	2414	49.1325
55.00709	74.205	2423	49.224
55.09402	74.205	2424	49.2341
55.18095	74.205	2363	48.6107
55.26788	74.205	2428	49.2747
55.35482	74.205	2576	50.7543
55.44175	74.205	2667	51.643
55.52868	74.205	2834	53.2353
55.61561	74.205	2697	51.9326
55.70254	74.205	2556	50.5569
55.78947	74.205	2441	49.4065
55.8764	74.205	2461	49.6085
55.96334	74.205	2303	47.9896
56.05027	74.205	2411	49.1019

56.1372	74.205	2286	47.8121
56.22413	74.205	2350	48.4768
56.31106	74.205	2366	48.6415
56.39799	74.205	2360	48.5798
56.48493	74.205	2444	49.4368
56.57186	74.205	2470	49.6991
56.65879	74.205	2545	50.448
56.74572	74.205	2645	51.4296
56.83265	74.205	2586	50.8527
56.91958	74.205	2432	49.3153
57.00651	74.205	2475	49.7494
57.09345	74.205	2374	48.7237
57.18038	74.205	2515	50.1498
57.26731	74.205	2665	51.6236
57.35424	74.205	2702	51.9808
57.44117	74.205	2671	51.6817
57.5281	74.205	2477	49.7695
57.61504	74.205	2469	49.689
57.70197	74.205	2486	49.8598
57.7889	74.205	2426	49.2544
57.87583	74.205	2414	49.1325
57.96276	74.205	2422	49.2138
58.04969	74.205	2458	49.5782
58.13662	74.205	2538	50.3786
58.22356	74.205	2574	50.7346
58.31049	74.205	2638	51.3615
58.39742	74.205	2775	52.6783
58.48435	74.205	2943	54.2494
58.57128	74.205	3066	55.3715
58.65821	74.205	3128	55.9285
58.74515	74.205	3237	56.8946
58.83208	74.205	2935	54.1756
58.91901	74.205	2658	51.5558
59.00594	74.205	2439	49.3862
59.09287	74.205	2397	48.9592
59.1798	74.205	2329	48.2597
59.26673	74.205	2233	47.2546
59.35367	74.205	2265	47.592
59.4406	74.205	2289	47.8435
59.52753	74.205	2441	49.4065
59.61446	74.205	2401	49

59.70139	74.205	2427	49.2646
59.78832	74.205	2349	48.4665
59.87525	74.205	2489	49.8899
59.96219	74.205	2624	51.225
60.04912	74.205	2604	51.0294
60.13605	74.205	2607	51.0588
60.22298	74.205	2592	50.9117
60.30991	74.205	2502	50.02
60.39684	74.205	2549	50.4876
60.48378	74.205	2669	51.6624
60.57071	74.205	2588	50.8724
60.65764	74.205	2789	52.811
60.74457	74.205	2817	53.0754
60.8315	74.205	2458	49.5782
60.91843	74.205	2552	50.5173
61.00536	74.205	2387	48.8569
61.0923	74.205	2330	48.2701
61.17923	74.205	2331	48.2804
61.26616	74.205	2349	48.4665
61.35309	74.205	2434	49.3356
61.44002	74.205	2359	48.5695
61.52695	74.205	2365	48.6313
61.61389	74.205	2279	47.7389
61.70082	74.205	2366	48.6415
61.78775	74.205	2387	48.8569
61.87468	74.205	2389	48.8774
61.96161	74.205	2364	48.621
62.04854	74.205	2392	48.9081
62.13547	74.205	2336	48.3322
62.22241	74.205	2329	48.2597
62.30934	74.205	2269	47.634
62.39627	74.205	2332	48.2908
62.4832	74.205	2325	48.2183
62.57013	74.205	2338	48.3529
62.65706	74.205	2299	47.9479
62.744	74.205	2298	47.9375
62.83093	74.205	2427	49.2646
62.91786	74.205	2268	47.6235
63.00479	74.205	2404	49.0306
63.09172	74.205	2293	47.8853
63.17865	74.205	2384	48.8262

63.26558	74.205	2367	48.6518
63.35252	74.205	2208	46.9894
63.43945	74.205	2266	47.6025
63.52638	74.205	2156	46.4327
63.61331	74.205	2235	47.2758
63.70024	74.205	2232	47.244
63.78717	74.205	2315	48.1144
63.8741	74.205	2335	48.3218
63.96104	74.205	2241	47.3392
64.04797	74.205	2264	47.5815
64.1349	74.205	2235	47.2758
64.22183	74.205	2178	46.669
64.30876	74.205	2073	45.5302
64.39569	74.205	2206	46.9681
64.48263	74.205	2249	47.4236
64.56956	74.205	2312	48.0833
64.65649	74.205	2239	47.3181
64.74342	74.205	2379	48.775
64.83035	74.205	2337	48.3425
64.91728	74.205	2394	48.9285
65.00421	74.205	2359	48.5695
65.09115	74.205	2373	48.7134
65.17808	74.205	2427	49.2646
65.26501	74.205	2439	49.3862
65.35194	74.205	2528	50.2792
65.43887	74.205	2657	51.5461
65.5258	74.205	2581	50.8035
65.61274	74.205	2502	50.02
65.69967	74.205	2386	48.8467
65.7866	74.205	2334	48.3115
65.87353	74.205	2266	47.6025
65.96046	74.205	2219	47.1063
66.04739	74.205	2169	46.5725
66.13432	74.205	2251	47.4447
66.22126	74.205	2193	46.8295
66.30819	74.205	2190	46.7974
66.39512	74.205	2253	47.4658
66.48205	74.205	2192	46.8188
66.56898	74.205	2205	46.9574
66.65591	74.205	2301	47.9687
66.74284	74.205	2209	47

66.82978	74.205	2305	48.0104
66.91671	74.205	2192	46.8188
67.00364	74.205	2228	47.2017
67.09057	74.205	2151	46.3789
67.1775	74.205	2195	46.8508
67.26443	74.205	2234	47.2652
67.35137	74.205	2168	46.5618
67.4383	74.205	2191	46.8081
67.52523	74.205	2241	47.3392
67.61216	74.205	2263	47.571
67.69909	74.205	2306	48.0208
67.78602	74.205	2433	49.3254
67.87295	74.205	2544	50.4381
67.95989	74.205	2431	49.3052
68.04682	74.205	2502	50.02
68.13375	74.205	2369	48.6724
68.22068	74.205	2316	48.1248
68.30761	74.205	2270	47.6445
68.39454	74.205	2217	47.085
68.48148	74.205	2126	46.1086
68.56841	74.205	2272	47.6655
68.65534	74.205	2195	46.8508
68.74227	74.205	2113	45.9674
68.8292	74.205	2117	46.0109
68.91613	74.205	2188	46.7761
69.00306	74.205	2081	45.618
69.09	74.205	2071	45.5082
69.17693	74.205	2126	46.1086
69.26386	74.205	2159	46.465
69.35079	74.205	2156	46.4327
69.43772	74.205	2158	46.4543
69.52465	74.205	2024	44.9889
69.61159	74.205	2121	46.0543
69.69852	74.205	2136	46.2169
69.78545	74.205	2244	47.3709
69.87238	74.205	2130	46.1519
69.95931	74.205	2065	45.4423
70.04624	74.205	2113	45.9674
70.13317	74.205	2066	45.4533
70.22011	74.205	2143	46.2925
70.30704	74.205	2095	45.7712

70.39397	74.205	2148	46.3465
70.4809	74.205	2180	46.6905
70.56783	74.205	2134	46.1952
70.65476	74.205	2100	45.8258
70.74169	74.205	2281	47.7598
70.82863	74.205	2233	47.2546
70.91556	74.205	2382	48.8057
71.00249	74.205	2251	47.4447
71.08942	74.205	2384	48.8262
71.17635	74.205	2171	46.594
71.26328	74.205	2201	46.9148
71.35022	74.205	2162	46.4973
71.43715	74.205	2057	45.3542
71.52408	74.205	2002	44.7437
71.61101	74.205	2129	46.1411
71.69794	74.205	2147	46.3357
71.78487	74.205	2063	45.4203
71.8718	74.205	2243	47.3603
71.95874	74.205	2181	46.7012
72.04567	74.205	2262	47.5605
72.1326	74.205	2203	46.9361
72.21953	74.205	2193	46.8295
72.30646	74.205	2126	46.1086
72.39339	74.205	2090	45.7165
72.48033	74.205	1992	44.6318
72.56726	74.205	2043	45.1996
72.65419	74.205	2099	45.8148
72.74112	74.205	1999	44.7102
72.82805	74.205	2150	46.3681
72.91498	74.205	2097	45.793
73.00191	74.205	2006	44.7884
73.08885	74.205	2044	45.2106
73.17578	74.205	2007	44.7996
73.26271	74.205	1987	44.5758
73.34964	74.205	1981	44.5084
73.43657	74.205	1932	43.9545
73.5235	74.205	2061	45.3982
73.61044	74.205	2091	45.7275
73.69737	74.205	1964	44.317
73.7843	74.205	1956	44.2267
73.87123	74.205	1994	44.6542

73.95816	74.205	1919	43.8064
74.04509	74.205	1928	43.909
74.13202	74.205	2048	45.2548
74.21896	74.205	1979	44.486
74.30589	74.205	2012	44.8553
74.39282	74.205	2003	44.7549
74.47975	74.205	2031	45.0666
74.56668	74.205	1909	43.6921
74.65361	74.205	1968	44.3621
74.74054	74.205	1941	44.0568
74.82748	74.205	2096	45.7821
74.91441	74.205	2073	45.5302
75.00134	74.205	2009	44.8219
75.08827	74.205	2097	45.793
75.1752	74.205	2039	45.1553
75.26213	74.205	1955	44.2154
75.34907	74.205	1954	44.2041
75.436	74.205	1958	44.2493
75.52293	74.205	1869	43.2319
75.60986	74.205	1939	44.0341
75.69679	74.205	1908	43.6807
75.78372	74.205	1888	43.4511
75.87065	74.205	1927	43.8976
75.95759	74.205	1876	43.3128
76.04452	74.205	1957	44.238
76.13145	74.205	1965	44.3283
76.21838	74.205	1944	44.0908
76.30531	74.205	1930	43.9318
76.39224	74.205	1882	43.382
76.47918	74.205	1871	43.2551
76.56611	74.205	1954	44.2041
76.65304	74.205	1860	43.1277
76.73997	74.205	2001	44.7325
76.8269	74.205	1949	44.1475
76.91383	74.205	2079	45.5961
77.00076	74.205	1952	44.1814
77.0877	74.205	2025	45
77.17463	74.205	2045	45.2217
77.26156	74.205	2018	44.9222
77.34849	74.205	1939	44.0341
77.43542	74.205	1965	44.3283

77.52235	74.205	1947	44.1248
77.60928	74.205	1910	43.7035
77.69622	74.205	1870	43.2435
77.78315	74.205	1932	43.9545
77.87008	74.205	1841	42.9069
77.95701	74.205	1807	42.5088
78.04394	74.205	1869	43.2319
78.13087	74.205	1824	42.7083
78.21781	74.205	1801	42.4382
78.30474	74.205	1762	41.9762
78.39167	74.205	1838	42.8719
78.4786	74.205	1765	42.0119
78.56553	74.205	1863	43.1625
78.65246	74.205	1753	41.8688
78.73939	74.205	1919	43.8064
78.82633	74.205	1976	44.4522
78.91326	74.205	1973	44.4185
79.00019	74.205	1860	43.1277
79.08712	74.205	1884	43.4051
79.17405	74.205	1835	42.8369
79.26098	74.205	1881	43.3705
79.34792	74.205	1928	43.909
79.43485	74.205	1761	41.9643
79.52178	74.205	1801	42.4382
79.60871	74.205	1785	42.2493
79.69564	74.205	1836	42.8486
79.78257	74.205	1662	40.7676
79.8695	74.205	1865	43.1856
79.95644	74.205	1789	42.2966

Measurement conditions]

Sample identification	Si/AlPO-5	
Comment		
Anode material	Cu	
K-Alpha1 wavelength	1.540598	
K-Alpha2 wavelength	1.544426	
Ratio K-Alpha2/K-Alpha1	0.5	
Divergence slit	Fixed	0.76mm
Monochromator used	NO	
Generator voltage	40	
Tube current	15	
File date and time	########	
Unit cell		
h k l	0 0 0	
Scan axis	Gonio	
Scan range	4.978	79.9999
Scan step size	0.086932	
No. of points	863	
Scan type	CONTINUOUS	
Time per step	74.205	

[Scan points]

Angle	TimePerStep	Intensity	ESD
5.021466	74.205	9592	97.9388
5.108397	74.205	9047	95.1157
5.195329	74.205	8609	92.7847
5.28226	74.205	8140	90.2219
5.369192	74.205	7724	87.8863
5.456123	74.205	7511	86.666
5.543055	74.205	7325	85.5862
5.629986	74.205	6825	82.6136
5.716918	74.205	6961	83.4326
5.803849	74.205	6644	81.5107
5.890781	74.205	6414	80.0875
5.977712	74.205	6181	78.6193
6.064644	74.205	5795	76.1249
6.151576	74.205	5248	72.4431

6.238507	74.205	5110	71.4843
6.325439	74.205	4677	68.3886
6.41237	74.205	4598	67.8086
6.499302	74.205	4338	65.8635
6.586233	74.205	4219	64.9538
6.673165	74.205	4177	64.6297
6.760096	74.205	4025	63.4429
6.847028	74.205	4152	64.436
6.933959	74.205	4207	64.8614
7.020891	74.205	4229	65.0308
7.107822	74.205	4254	65.2227
7.194754	74.205	4645	68.1542
7.281685	74.205	5308	72.856
7.368617	74.205	6628	81.4125
7.455548	74.205	8620	92.844
7.54248	74.205	12678	112.5966
7.629411	74.205	19468	139.5278
7.716343	74.205	22203	149.0067
7.803274	74.205	9515	97.5449
7.890206	74.205	4274	65.3758
7.977137	74.205	3735	61.1146
8.064069	74.205	3418	58.4637
8.151	74.205	3323	57.6455
8.237932	74.205	2861	53.4883
8.324864	74.205	2889	53.7494
8.411795	74.205	2859	53.4696
8.498727	74.205	2851	53.3948
8.585658	74.205	2820	53.1037
8.67259	74.205	2870	53.5724
8.759521	74.205	2779	52.7162
8.846453	74.205	2732	52.2685
8.933384	74.205	2859	53.4696
9.020316	74.205	2605	51.0392
9.107247	74.205	2567	50.6656
9.194179	74.205	2624	51.225
9.28111	74.205	2675	51.7204
9.368042	74.205	2647	51.449
9.454973	74.205	2587	50.8626
9.541905	74.205	2625	51.2348
9.628836	74.205	2561	50.6063
9.715768	74.205	2572	50.7149

9.802699	74.205	2630	51.2835
9.889631	74.205	2569	50.6853
9.976562	74.205	2375	48.734
10.06349	74.205	2514	50.1398
10.15043	74.205	2432	49.3153
10.23736	74.205	2303	47.9896
10.32429	74.205	2381	48.7955
10.41122	74.205	2430	49.295
10.49815	74.205	2392	48.9081
10.58508	74.205	2473	49.7293
10.67201	74.205	2432	49.3153
10.75895	74.205	2344	48.4149
10.84588	74.205	2393	48.9183
10.93281	74.205	2383	48.816
11.01974	74.205	2315	48.1144
11.10667	74.205	2297	47.927
11.1936	74.205	2254	47.4763
11.28054	74.205	2271	47.655
11.36747	74.205	2348	48.4562
11.4544	74.205	2322	48.1871
11.54133	74.205	2335	48.3218
11.62826	74.205	2347	48.4458
11.71519	74.205	2315	48.1144
11.80212	74.205	2352	48.4974
11.88906	74.205	2217	47.085
11.97599	74.205	2356	48.5386
12.06292	74.205	2258	47.5184
12.14985	74.205	2190	46.7974
12.23678	74.205	2158	46.4543
12.32371	74.205	2205	46.9574
12.41064	74.205	2272	47.6655
12.49758	74.205	2405	49.0408
12.58451	74.205	2325	48.2183
12.67144	74.205	2330	48.2701
12.75837	74.205	2675	51.7204
12.8453	74.205	2857	53.4509
12.93223	74.205	3873	62.2334
13.01917	74.205	5004	70.739
13.1061	74.205	5562	74.5788
13.19303	74.205	3932	62.7057
13.27996	74.205	2695	51.9134

13.36689	74.205	2382	48.8057
13.45382	74.205	2302	47.9792
13.54075	74.205	2275	47.697
13.62769	74.205	2284	47.7912
13.71462	74.205	2305	48.0104
13.80155	74.205	2291	47.8644
13.88848	74.205	2196	46.8615
13.97541	74.205	2256	47.4974
14.06234	74.205	2274	47.6865
14.14928	74.205	2215	47.0638
14.23621	74.205	2330	48.2701
14.32314	74.205	2148	46.3465
14.41007	74.205	2271	47.655
14.497	74.205	2164	46.5188
14.58393	74.205	2301	47.9687
14.67086	74.205	2310	48.0625
14.7578	74.205	2378	48.7647
14.84473	74.205	2644	51.4198
14.93166	74.205	3053	55.254
15.01859	74.205	3582	59.8498
15.10552	74.205	3894	62.4019
15.19245	74.205	2887	53.7308
15.27939	74.205	2388	48.8672
15.36632	74.205	2413	49.1223
15.45325	74.205	2429	49.2849
15.54018	74.205	2267	47.613
15.62711	74.205	2282	47.7703
15.71404	74.205	2314	48.1041
15.80097	74.205	2260	47.5395
15.88791	74.205	2356	48.5386
15.97484	74.205	2364	48.621
16.06177	74.205	2409	49.0816
16.1487	74.205	2314	48.1041
16.23563	74.205	2420	49.1935
16.32256	74.205	2450	49.4975
16.40949	74.205	2321	48.1768
16.49643	74.205	2469	49.689
16.58336	74.205	2466	49.6588
16.67029	74.205	2440	49.3964
16.75722	74.205	2450	49.4975
16.84415	74.205	2541	50.4083

16.93108	74.205	2487	49.8698
17.01802	74.205	2550	50.4975
17.10495	74.205	2410	49.0918
17.19188	74.205	2617	51.1566
17.27881	74.205	2519	50.1896
17.36574	74.205	2637	51.3517
17.45267	74.205	2654	51.517
17.5396	74.205	2577	50.7642
17.62654	74.205	2671	51.6817
17.71347	74.205	2512	50.1199
17.8004	74.205	2630	51.2835
17.88733	74.205	2724	52.192
17.97426	74.205	2708	52.0384
18.06119	74.205	2705	52.0096
18.14813	74.205	2732	52.2685
18.23506	74.205	2770	52.6308
18.32199	74.205	2814	53.0471
18.40892	74.205	2799	52.9056
18.49585	74.205	2793	52.8488
18.58278	74.205	2787	52.792
18.66971	74.205	2868	53.5537
18.75665	74.205	2884	53.7029
18.84358	74.205	3017	54.9272
18.93051	74.205	3063	55.3444
19.01744	74.205	2976	54.5527
19.10437	74.205	3085	55.5428
19.1913	74.205	3043	55.1634
19.27824	74.205	3222	56.7627
19.36517	74.205	3182	56.4092
19.4521	74.205	3339	57.7841
19.53903	74.205	3738	61.1392
19.62596	74.205	4279	65.4141
19.71289	74.205	5728	75.6836
19.79982	74.205	8180	90.4434
19.88676	74.205	10034	100.1699
19.97369	74.205	8081	89.8944
20.06062	74.205	4725	68.7386
20.14755	74.205	3856	62.0967
20.23448	74.205	3712	60.9262
20.32141	74.205	3808	61.709
20.40834	74.205	3603	60.025

20.49528	74.205	3637	60.3075
20.58221	74.205	3741	61.1637
20.66914	74.205	3671	60.5888
20.75607	74.205	3747	61.2127
20.843	74.205	3957	62.9047
20.92993	74.205	4151	64.4283
21.01687	74.205	4629	68.0368
21.1038	74.205	5591	74.773
21.19073	74.205	7543	86.8504
21.27766	74.205	10807	103.9567
21.36459	74.205	12591	112.2096
21.45152	74.205	9678	98.3768
21.53845	74.205	5613	74.92
21.62539	74.205	4583	67.6979
21.71232	74.205	4382	66.1967
21.79925	74.205	4196	64.7765
21.88618	74.205	4284	65.4523
21.97311	74.205	4328	65.7875
22.06004	74.205	4433	66.5808
22.14698	74.205	4729	68.7677
22.23391	74.205	5340	73.0753
22.32084	74.205	6724	82
22.40777	74.205	10170	100.8464
22.4947	74.205	15172	123.1747
22.58163	74.205	18729	136.8539
22.66856	74.205	14195	119.1428
22.7555	74.205	7773	88.1646
22.84243	74.205	5282	72.6774
22.92936	74.205	4722	68.7168
23.01629	74.205	4549	67.4463
23.10322	74.205	4421	66.4906
23.19015	74.205	4404	66.3626
23.27708	74.205	4302	65.5896
23.36402	74.205	4319	65.7191
23.45095	74.205	4386	66.2269
23.53788	74.205	4298	65.5591
23.62481	74.205	4233	65.0615
23.71174	74.205	4363	66.053
23.79867	74.205	4237	65.0922
23.88561	74.205	4274	65.3758
23.97254	74.205	4293	65.521

24.05947	74.205	4295	65.5362
24.1464	74.205	4269	65.3376
24.23333	74.205	4220	64.9615
24.32026	74.205	4215	64.923
24.40719	74.205	4152	64.436
24.49413	74.205	4233	65.0615
24.58106	74.205	4245	65.1537
24.66799	74.205	4137	64.3195
24.75492	74.205	4321	65.7343
24.84185	74.205	4413	66.4304
24.92878	74.205	4532	67.3201
25.01572	74.205	4770	69.0652
25.10265	74.205	4505	67.1193
25.18958	74.205	4335	65.8407
25.27651	74.205	4299	65.5668
25.36344	74.205	4267	65.3223
25.45037	74.205	4202	64.8228
25.5373	74.205	4290	65.4981
25.62424	74.205	4400	66.3325
25.71117	74.205	4420	66.4831
25.7981	74.205	4934	70.2424
25.88503	74.205	6274	79.2086
25.97196	74.205	7921	89
26.05889	74.205	8893	94.3027
26.14583	74.205	6902	83.0783
26.23276	74.205	4985	70.6045
26.31969	74.205	4359	66.0227
26.40662	74.205	4234	65.0692
26.49355	74.205	4265	65.307
26.58048	74.205	4033	63.5059
26.66741	74.205	4095	63.9922
26.75435	74.205	4036	63.5295
26.84128	74.205	3878	62.2736
26.92821	74.205	3922	62.6259
27.01514	74.205	3856	62.0967
27.10207	74.205	3945	62.8092
27.189	74.205	3898	62.434
27.27593	74.205	3995	63.206
27.36287	74.205	3771	61.4085
27.4498	74.205	3903	62.474
27.53673	74.205	3667	60.5558

27.62366	74.205	3732	61.0901
27.71059	74.205	3756	61.2862
27.79752	74.205	3656	60.4649
27.88446	74.205	3674	60.6135
27.97139	74.205	3683	60.6877
28.05832	74.205	3727	61.0492
28.14525	74.205	3550	59.5819
28.23218	74.205	3769	61.3922
28.31911	74.205	3761	61.327
28.40604	74.205	3565	59.7076
28.49298	74.205	3659	60.4897
28.57991	74.205	3725	61.0328
28.66684	74.205	3584	59.8665
28.75377	74.205	3622	60.1831
28.8407	74.205	3681	60.6712
28.92763	74.205	3884	62.3217
29.01457	74.205	4390	66.2571
29.1015	74.205	5328	72.9932
29.18843	74.205	5971	77.2722
29.27536	74.205	5292	72.7461
29.36229	74.205	4275	65.3835
29.44922	74.205	3693	60.7701
29.53615	74.205	3517	59.3043
29.62309	74.205	3438	58.6345
29.71002	74.205	3502	59.1777
29.79695	74.205	3535	59.4559
29.88388	74.205	3977	63.0635
29.97081	74.205	4769	69.0579
30.05774	74.205	5668	75.2861
30.14468	74.205	5794	76.1183
30.23161	74.205	4837	69.5485
30.31854	74.205	3607	60.0583
30.40547	74.205	3301	57.4543
30.4924	74.205	3176	56.356
30.57933	74.205	3138	56.0179
30.66626	74.205	3110	55.7674
30.7532	74.205	3156	56.1783
30.84013	74.205	3124	55.8928
30.92706	74.205	3108	55.7494
31.01399	74.205	3029	55.0364
31.10092	74.205	2985	54.6352

31.18785	74.205	3108	55.7494
31.27478	74.205	3007	54.8361
31.36172	74.205	2964	54.4426
31.44865	74.205	2926	54.0925
31.53558	74.205	2935	54.1756
31.62251	74.205	2889	53.7494
31.70944	74.205	2815	53.0566
31.79637	74.205	2788	52.8015
31.88331	74.205	2874	53.6097
31.97024	74.205	2971	54.5069
32.05717	74.205	2856	53.4416
32.1441	74.205	2747	52.4118
32.23103	74.205	2831	53.2071
32.31796	74.205	2826	53.1601
32.40489	74.205	2714	52.0961
32.49183	74.205	2833	53.2259
32.57876	74.205	2651	51.4879
32.66569	74.205	2707	52.0288
32.75262	74.205	2621	51.1957
32.83955	74.205	2726	52.2111
32.92648	74.205	2662	51.5946
33.01342	74.205	2644	51.4198
33.10035	74.205	2700	51.9615
33.18728	74.205	2584	50.8331
33.27421	74.205	2618	51.1664
33.36114	74.205	2566	50.6557
33.44807	74.205	2637	51.3517
33.535	74.205	2759	52.5262
33.62194	74.205	2847	53.3573
33.70887	74.205	3288	57.3411
33.7958	74.205	3314	57.5674
33.88273	74.205	2980	54.5894
33.96966	74.205	2776	52.6878
34.05659	74.205	2578	50.774
34.14352	74.205	2530	50.2991
34.23046	74.205	2711	52.0673
34.31739	74.205	2913	53.9722
34.40432	74.205	3583	59.8582
34.49125	74.205	4416	66.453
34.57818	74.205	4905	70.0357
34.66511	74.205	4440	66.6333

34.75205	74.205	3233	56.8595
34.83898	74.205	2662	51.5946
34.92591	74.205	2608	51.0686
35.01284	74.205	2439	49.3862
35.09977	74.205	2377	48.7545
35.1867	74.205	2329	48.2597
35.27363	74.205	2426	49.2544
35.36057	74.205	2287	47.8226
35.4475	74.205	2326	48.2286
35.53443	74.205	2326	48.2286
35.62136	74.205	2270	47.6445
35.70829	74.205	2376	48.7442
35.79522	74.205	2227	47.1911
35.88216	74.205	2248	47.4131
35.96909	74.205	2239	47.3181
36.05602	74.205	2266	47.6025
36.14295	74.205	2288	47.833
36.22988	74.205	2293	47.8853
36.31681	74.205	2300	47.9583
36.40374	74.205	2262	47.5605
36.49068	74.205	2283	47.7807
36.57761	74.205	2282	47.7703
36.66454	74.205	2191	46.8081
36.75147	74.205	2321	48.1768
36.8384	74.205	2303	47.9896
36.92533	74.205	2535	50.3488
37.01227	74.205	2671	51.6817
37.0992	74.205	2812	53.0283
37.18613	74.205	2612	51.1077
37.27306	74.205	2359	48.5695
37.35999	74.205	2262	47.5605
37.44692	74.205	2226	47.1805
37.53385	74.205	2237	47.2969
37.62079	74.205	2315	48.1144
37.70772	74.205	2636	51.342
37.79465	74.205	3118	55.8391
37.88158	74.205	3606	60.05
37.96851	74.205	3820	61.8061
38.05544	74.205	3390	58.2237
38.14237	74.205	2721	52.1632
38.22931	74.205	2229	47.2123

38.31624	74.205	2229	47.2123
38.40317	74.205	2188	46.7761
38.4901	74.205	2118	46.0217
38.57703	74.205	2117	46.0109
38.66396	74.205	2037	45.1331
38.7509	74.205	2079	45.5961
38.83783	74.205	2064	45.4313
38.92476	74.205	2059	45.3762
39.01169	74.205	2023	44.9778
39.09862	74.205	2006	44.7884
39.18555	74.205	2026	45.0111
39.27248	74.205	2042	45.1885
39.35942	74.205	2182	46.7119
39.44635	74.205	2092	45.7384
39.53328	74.205	2092	45.7384
39.62021	74.205	2105	45.8803
39.70714	74.205	2091	45.7275
39.79407	74.205	2092	45.7384
39.88101	74.205	2172	46.6047
39.96794	74.205	2135	46.2061
40.05487	74.205	2107	45.9021
40.1418	74.205	2090	45.7165
40.22873	74.205	2095	45.7712
40.31566	74.205	2140	46.2601
40.40259	74.205	2064	45.4313
40.48953	74.205	2090	45.7165
40.57646	74.205	2072	45.5192
40.66339	74.205	2090	45.7165
40.75032	74.205	2099	45.8148
40.83725	74.205	2185	46.744
40.92418	74.205	2095	45.7712
41.01112	74.205	2108	45.913
41.09805	74.205	2062	45.4093
41.18498	74.205	2186	46.7547
41.27191	74.205	2208	46.9894
41.35884	74.205	2143	46.2925
41.44577	74.205	2244	47.3709
41.5327	74.205	2367	48.6518
41.61964	74.205	2323	48.1975
41.70657	74.205	2124	46.0869
41.7935	74.205	2059	45.3762

41.88043	74.205	2018	44.9222
41.96736	74.205	2124	46.0869
42.05429	74.205	2160	46.4758
42.14122	74.205	2269	47.634
42.22816	74.205	2368	48.6621
42.31509	74.205	2470	49.6991
42.40202	74.205	2411	49.1019
42.48895	74.205	2208	46.9894
42.57588	74.205	2116	46
42.66281	74.205	2134	46.1952
42.74975	74.205	1988	44.587
42.83668	74.205	2096	45.7821
42.92361	74.205	2054	45.3211
43.01054	74.205	2118	46.0217
43.09747	74.205	2335	48.3218
43.1844	74.205	2249	47.4236
43.27133	74.205	2173	46.6154
43.35827	74.205	2098	45.8039
43.4452	74.205	2075	45.5522
43.53213	74.205	2052	45.299
43.61906	74.205	2147	46.3357
43.70599	74.205	2130	46.1519
43.79292	74.205	2160	46.4758
43.87986	74.205	2108	45.913
43.96679	74.205	1977	44.4635
44.05372	74.205	2011	44.8442
44.14065	74.205	1884	43.4051
44.22758	74.205	1881	43.3705
44.31451	74.205	1865	43.1856
44.40144	74.205	2010	44.833
44.48838	74.205	1911	43.715
44.57531	74.205	1798	42.4028
44.66224	74.205	1902	43.6119
44.74917	74.205	1829	42.7668
44.8361	74.205	1883	43.3935
44.92303	74.205	2012	44.8553
45.00996	74.205	2004	44.7661
45.0969	74.205	1931	43.9431
45.18383	74.205	1957	44.238
45.27076	74.205	1947	44.1248
45.35769	74.205	1926	43.8862

45.44462	74.205	1802	42.45
45.53155	74.205	1921	43.8292
45.61849	74.205	1949	44.1475
45.70542	74.205	1982	44.5197
45.79235	74.205	1922	43.8406
45.87928	74.205	1856	43.0813
45.96621	74.205	1861	43.1393
46.05314	74.205	1919	43.8064
46.14007	74.205	1787	42.2729
46.22701	74.205	1797	42.391
46.31394	74.205	1864	43.1741
46.40087	74.205	1869	43.2319
46.4878	74.205	1833	42.8135
46.57473	74.205	1863	43.1625
46.66166	74.205	1768	42.0476
46.7486	74.205	1783	42.2256
46.83553	74.205	1790	42.3084
46.92246	74.205	1878	43.3359
47.00939	74.205	1764	42
47.09632	74.205	1710	41.3521
47.18325	74.205	1776	42.1426
47.27018	74.205	1786	42.2611
47.35712	74.205	1836	42.8486
47.44405	74.205	2019	44.9333
47.53098	74.205	2253	47.4658
47.61791	74.205	2396	48.949
47.70484	74.205	2531	50.309
47.79177	74.205	2289	47.8435
47.87871	74.205	2101	45.8367
47.96564	74.205	1936	44
48.05257	74.205	1806	42.4971
48.1395	74.205	1798	42.4028
48.22643	74.205	1717	41.4367
48.31336	74.205	1784	42.2374
48.40029	74.205	1729	41.5812
48.48723	74.205	1717	41.4367
48.57416	74.205	1574	39.6737
48.66109	74.205	1638	40.4722
48.74802	74.205	1746	41.7852
48.83495	74.205	1758	41.9285
48.92188	74.205	1664	40.7922

49.00881	74.205	1719	41.4608
49.09575	74.205	1687	41.0731
49.18268	74.205	1689	41.0974
49.26961	74.205	1606	40.0749
49.35654	74.205	1734	41.6413
49.44347	74.205	1773	42.107
49.5304	74.205	1729	41.5812
49.61734	74.205	1716	41.4246
49.70427	74.205	1672	40.8901
49.7912	74.205	1742	41.7373
49.87813	74.205	1791	42.3202
49.96506	74.205	1729	41.5812
50.05199	74.205	1707	41.3159
50.13892	74.205	1673	40.9023
50.22586	74.205	1681	41
50.31279	74.205	1654	40.6694
50.39972	74.205	1622	40.2741
50.48665	74.205	1743	41.7493
50.57358	74.205	1668	40.8412
50.66051	74.205	1703	41.2674
50.74745	74.205	1745	41.7732
50.83438	74.205	1720	41.4729
50.92131	74.205	1695	41.1704
51.00824	74.205	1648	40.5956
51.09517	74.205	1708	41.328
51.1821	74.205	1763	41.9881
51.26903	74.205	1837	42.8602
51.35597	74.205	1871	43.2551
51.4429	74.205	1934	43.9773
51.52983	74.205	1879	43.3474
51.61676	74.205	1808	42.5206
51.70369	74.205	1803	42.4617
51.79062	74.205	1691	41.1218
51.87756	74.205	1780	42.19
51.96449	74.205	1830	42.7785
52.05142	74.205	1849	43
52.13835	74.205	1849	43
52.22528	74.205	1827	42.7434
52.31221	74.205	1803	42.4617
52.39914	74.205	1665	40.8044
52.48608	74.205	1773	42.107

52.57301	74.205	1718	41.4488
52.65994	74.205	1748	41.8091
52.74687	74.205	1777	42.1545
52.8338	74.205	1745	41.7732
52.92073	74.205	1688	41.0853
53.00766	74.205	1563	39.5348
53.0946	74.205	1613	40.1622
53.18153	74.205	1673	40.9023
53.26846	74.205	1626	40.3237
53.35539	74.205	1638	40.4722
53.44232	74.205	1722	41.497
53.52925	74.205	1566	39.5727
53.61619	74.205	1546	39.3192
53.70312	74.205	1590	39.8748
53.79005	74.205	1606	40.0749
53.87698	74.205	1595	39.9375
53.96391	74.205	1568	39.598
54.05084	74.205	1501	38.7427
54.13777	74.205	1592	39.8999
54.22471	74.205	1537	39.2046
54.31164	74.205	1588	39.8497
54.39857	74.205	1613	40.1622
54.4855	74.205	1557	39.4588
54.57243	74.205	1564	39.5474
54.65936	74.205	1553	39.4081
54.7463	74.205	1541	39.2556
54.83323	74.205	1615	40.1871
54.92016	74.205	1565	39.5601
55.00709	74.205	1563	39.5348
55.09402	74.205	1571	39.6358
55.18095	74.205	1591	39.8873
55.26788	74.205	1661	40.7554
55.35482	74.205	1733	41.6293
55.44175	74.205	1797	42.391
55.52868	74.205	1860	43.1277
55.61561	74.205	1867	43.2088
55.70254	74.205	1855	43.0697
55.78947	74.205	1728	41.5692
55.8764	74.205	1572	39.6485
55.96334	74.205	1590	39.8748
56.05027	74.205	1515	38.923

56.1372	74.205	1560	39.4968
56.22413	74.205	1575	39.6863
56.31106	74.205	1579	39.7366
56.39799	74.205	1610	40.1248
56.48493	74.205	1665	40.8044
56.57186	74.205	1691	41.1218
56.65879	74.205	1753	41.8688
56.74572	74.205	1769	42.0595
56.83265	74.205	1683	41.0244
56.91958	74.205	1625	40.3113
57.00651	74.205	1613	40.1622
57.09345	74.205	1643	40.5339
57.18038	74.205	1758	41.9285
57.26731	74.205	1708	41.328
57.35424	74.205	1757	41.9166
57.44117	74.205	1782	42.2137
57.5281	74.205	1713	41.3884
57.61504	74.205	1604	40.05
57.70197	74.205	1586	39.8246
57.7889	74.205	1602	40.025
57.87583	74.205	1532	39.1408
57.96276	74.205	1616	40.1995
58.04969	74.205	1563	39.5348
58.13662	74.205	1594	39.9249
58.22356	74.205	1611	40.1373
58.31049	74.205	1816	42.6146
58.39742	74.205	1946	44.1135
58.48435	74.205	1991	44.6206
58.57128	74.205	2195	46.8508
58.65821	74.205	2233	47.2546
58.74515	74.205	2119	46.0326
58.83208	74.205	1872	43.2666
58.91901	74.205	1725	41.5331
59.00594	74.205	1582	39.7744
59.09287	74.205	1562	39.5221
59.1798	74.205	1635	40.4351
59.26673	74.205	1549	39.3573
59.35367	74.205	1578	39.724
59.4406	74.205	1605	40.0625
59.52753	74.205	1599	39.9875
59.61446	74.205	1683	41.0244

59.70139	74.205	1594	39.9249
59.78832	74.205	1600	40
59.87525	74.205	1634	40.4228
59.96219	74.205	1663	40.7799
60.04912	74.205	1782	42.2137
60.13605	74.205	1785	42.2493
60.22298	74.205	1780	42.19
60.30991	74.205	1699	41.2189
60.39684	74.205	1792	42.332
60.48378	74.205	1774	42.1189
60.57071	74.205	1937	44.0114
60.65764	74.205	1904	43.6348
60.74457	74.205	1910	43.7035
60.8315	74.205	1841	42.9069
60.91843	74.205	1647	40.5832
61.00536	74.205	1638	40.4722
61.0923	74.205	1585	39.8121
61.17923	74.205	1509	38.8458
61.26616	74.205	1566	39.5727
61.35309	74.205	1565	39.5601
61.44002	74.205	1555	39.4335
61.52695	74.205	1598	39.975
61.61389	74.205	1512	38.8844
61.70082	74.205	1584	39.7995
61.78775	74.205	1476	38.4187
61.87468	74.205	1667	40.8289
61.96161	74.205	1602	40.025
62.04854	74.205	1698	41.2068
62.13547	74.205	1596	39.95
62.22241	74.205	1580	39.7492
62.30934	74.205	1554	39.4208
62.39627	74.205	1564	39.5474
62.4832	74.205	1492	38.6264
62.57013	74.205	1614	40.1746
62.65706	74.205	1593	39.9124
62.744	74.205	1653	40.6571
62.83093	74.205	1617	40.2119
62.91786	74.205	1603	40.0375
63.00479	74.205	1635	40.4351
63.09172	74.205	1688	41.0853
63.17865	74.205	1549	39.3573

63.26558	74.205	1589	39.8623
63.35252	74.205	1550	39.37
63.43945	74.205	1564	39.5474
63.52638	74.205	1536	39.1918
63.61331	74.205	1505	38.7943
63.70024	74.205	1554	39.4208
63.78717	74.205	1510	38.8587
63.8741	74.205	1581	39.7618
63.96104	74.205	1545	39.3065
64.04797	74.205	1496	38.6782
64.1349	74.205	1642	40.5216
64.22183	74.205	1480	38.4708
64.30876	74.205	1542	39.2683
64.39569	74.205	1584	39.7995
64.48263	74.205	1595	39.9375
64.56956	74.205	1619	40.2368
64.65649	74.205	1584	39.7995
64.74342	74.205	1630	40.3733
64.83035	74.205	1674	40.9145
64.91728	74.205	1660	40.7431
65.00421	74.205	1652	40.6448
65.09115	74.205	1678	40.9634
65.17808	74.205	1687	41.0731
65.26501	74.205	1830	42.7785
65.35194	74.205	1870	43.2435
65.43887	74.205	1938	44.0227
65.5258	74.205	1980	44.4972
65.61274	74.205	1860	43.1277
65.69967	74.205	1813	42.5793
65.7866	74.205	1719	41.4608
65.87353	74.205	1638	40.4722
65.96046	74.205	1667	40.8289
66.04739	74.205	1585	39.8121
66.13432	74.205	1587	39.8372
66.22126	74.205	1573	39.6611
66.30819	74.205	1593	39.9124
66.39512	74.205	1607	40.0874
66.48205	74.205	1472	38.3667
66.56898	74.205	1613	40.1622
66.65591	74.205	1548	39.3446
66.74284	74.205	1532	39.1408

66.82978	74.205	1554	39.4208
66.91671	74.205	1579	39.7366
67.00364	74.205	1529	39.1024
67.09057	74.205	1521	39
67.1775	74.205	1547	39.3319
67.26443	74.205	1526	39.064
67.35137	74.205	1512	38.8844
67.4383	74.205	1531	39.128
67.52523	74.205	1573	39.6611
67.61216	74.205	1559	39.4842
67.69909	74.205	1486	38.5487
67.78602	74.205	1617	40.2119
67.87295	74.205	1689	41.0974
67.95989	74.205	1676	40.939
68.04682	74.205	1730	41.5933
68.13375	74.205	1681	41
68.22068	74.205	1617	40.2119
68.30761	74.205	1553	39.4081
68.39454	74.205	1522	39.0128
68.48148	74.205	1513	38.8973
68.56841	74.205	1505	38.7943
68.65534	74.205	1427	37.7757
68.74227	74.205	1513	38.8973
68.8292	74.205	1428	37.7889
68.91613	74.205	1439	37.9342
69.00306	74.205	1400	37.4166
69.09	74.205	1382	37.1753
69.17693	74.205	1460	38.2099
69.26386	74.205	1413	37.5899
69.35079	74.205	1394	37.3363
69.43772	74.205	1475	38.4057
69.52465	74.205	1430	37.8153
69.61159	74.205	1455	38.1445
69.69852	74.205	1492	38.6264
69.78545	74.205	1399	37.4032
69.87238	74.205	1379	37.1349
69.95931	74.205	1381	37.1618
70.04624	74.205	1439	37.9342
70.13317	74.205	1389	37.2693
70.22011	74.205	1395	37.3497
70.30704	74.205	1409	37.5366

70.39397	74.205	1360	36.8782
70.4809	74.205	1382	37.1753
70.56783	74.205	1369	37
70.65476	74.205	1426	37.7624
70.74169	74.205	1363	36.9188
70.82863	74.205	1452	38.1051
70.91556	74.205	1485	38.5357
71.00249	74.205	1551	39.3827
71.08942	74.205	1487	38.5616
71.17635	74.205	1514	38.9102
71.26328	74.205	1436	37.8946
71.35022	74.205	1452	38.1051
71.43715	74.205	1451	38.092
71.52408	74.205	1294	35.9722
71.61101	74.205	1350	36.7423
71.69794	74.205	1318	36.3043
71.78487	74.205	1327	36.428
71.8718	74.205	1403	37.4566
71.95874	74.205	1434	37.8682
72.04567	74.205	1423	37.7227
72.1326	74.205	1363	36.9188
72.21953	74.205	1425	37.7492
72.30646	74.205	1440	37.9473
72.39339	74.205	1411	37.5633
72.48033	74.205	1322	36.3593
72.56726	74.205	1389	37.2693
72.65419	74.205	1363	36.9188
72.74112	74.205	1380	37.1484
72.82805	74.205	1312	36.2215
72.91498	74.205	1312	36.2215
73.00191	74.205	1312	36.2215
73.08885	74.205	1320	36.3318
73.17578	74.205	1256	35.4401
73.26271	74.205	1331	36.4829
73.34964	74.205	1246	35.2987
73.43657	74.205	1310	36.1939
73.5235	74.205	1228	35.0428
73.61044	74.205	1277	35.7351
73.69737	74.205	1258	35.4683
73.7843	74.205	1260	35.4965
73.87123	74.205	1279	35.7631

73.95816	74.205	1229	35.0571
74.04509	74.205	1300	36.0555
74.13202	74.205	1313	36.2353
74.21896	74.205	1312	36.2215
74.30589	74.205	1334	36.524
74.39282	74.205	1263	35.5387
74.47975	74.205	1186	34.4384
74.56668	74.205	1242	35.242
74.65361	74.205	1227	35.0286
74.74054	74.205	1167	34.1614
74.82748	74.205	1300	36.0555
74.91441	74.205	1275	35.7071
75.00134	74.205	1283	35.819
75.08827	74.205	1344	36.6606
75.1752	74.205	1319	36.318
75.26213	74.205	1232	35.0999
75.34907	74.205	1224	34.9857
75.436	74.205	1189	34.4819
75.52293	74.205	1141	33.7787
75.60986	74.205	1196	34.5832
75.69679	74.205	1176	34.2929
75.78372	74.205	1167	34.1614
75.87065	74.205	1175	34.2783
75.95759	74.205	1195	34.5688
76.04452	74.205	1153	33.9559
76.13145	74.205	1157	34.0147
76.21838	74.205	1154	33.9706
76.30531	74.205	1168	34.176
76.39224	74.205	1140	33.7639
76.47918	74.205	1209	34.7707
76.56611	74.205	1144	33.8231
76.65304	74.205	1184	34.4093
76.73997	74.205	1228	35.0428
76.8269	74.205	1190	34.4964
76.91383	74.205	1088	32.9848
77.00076	74.205	1245	35.2846
77.0877	74.205	1234	35.1283
77.17463	74.205	1261	35.5106
77.26156	74.205	1274	35.6931
77.34849	74.205	1231	35.0856
77.43542	74.205	1157	34.0147

77.52235	74.205	1158	34.0294
77.60928	74.205	1211	34.7994
77.69622	74.205	1110	33.3167
77.78315	74.205	1031	32.1092
77.87008	74.205	1136	33.7046
77.95701	74.205	1092	33.0454
78.04394	74.205	1115	33.3916
78.13087	74.205	1121	33.4813
78.21781	74.205	1054	32.4654
78.30474	74.205	1037	32.2025
78.39167	74.205	1175	34.2783
78.4786	74.205	992	31.496
78.56553	74.205	1127	33.5708
78.65246	74.205	1065	32.6343
78.73939	74.205	1089	33
78.82633	74.205	1137	33.7194
78.91326	74.205	1185	34.4238
79.00019	74.205	1132	33.6452
79.08712	74.205	1105	33.2415
79.17405	74.205	1037	32.2025
79.26098	74.205	1122	33.4963
79.34792	74.205	1039	32.2335
79.43485	74.205	1057	32.5115
79.52178	74.205	983	31.3528
79.60871	74.205	1110	33.3167
79.69564	74.205	1034	32.1559
79.78257	74.205	1045	32.3265
79.8695	74.205	1045	32.3265
79.95644	74.205	1089	33

[Measurement conditions]			
Sample identification	Pd/AlPO-5		
Comment			
Anode material	Cu		
K-Alpha1 wavelength	1.540598		
K-Alpha2 wavelength	1.544426		
Ratio K-Alpha2/K-Alpha1	0.5		
Divergence slit	Fixed	0.76mm	
Monochromator used	NO		
Generator voltage	40		
Tube current	15		
File date and time	########		
Unit cell			
h k l	0 0 0		
Scan axis	Gonio		
Scan range	4.978	79.9999	
Scan step size	0.086932		
No. of points	863		
Scan type	CONTINUOUS		
Time per step	74.205		
[Scan points]			
Angle	TimePerStep	Intensity	ESD
5.021466	74.205	8197	90.5373
5.108397	74.205	7763	88.1079
5.195329	74.205	7440	86.2554
5.28226	74.205	7300	85.44
5.369192	74.205	6859	82.8191
5.456123	74.205	6617	81.3449
5.543055	74.205	6340	79.6241
5.629986	74.205	6099	78.0961
5.716918	74.205	6028	77.6402
5.803849	74.205	5867	76.5963
5.890781	74.205	5716	75.6042
5.977712	74.205	5466	73.9324
6.064644	74.205	5052	71.0774
6.151576	74.205	4795	69.2459

6.238507	74.205	4425	66.5207
6.325439	74.205	4079	63.867
6.41237	74.205	4049	63.6318
6.499302	74.205	4022	63.4192
6.586233	74.205	3927	62.6658
6.673165	74.205	3973	63.0317
6.760096	74.205	4143	64.3661
6.847028	74.205	4549	67.4463
6.933959	74.205	4793	69.2315
7.020891	74.205	5569	74.6257
7.107822	74.205	6756	82.1949
7.194754	74.205	8916	94.4246
7.281685	74.205	12394	111.3283
7.368617	74.205	19151	138.3871
7.455548	74.205	31550	177.6232
7.54248	74.205	51219	226.3162
7.629411	74.205	39591	198.9749
7.716343	74.205	11299	106.2968
7.803274	74.205	5242	72.4017
7.890206	74.205	4295	65.5362
7.977137	74.205	3718	60.9754
8.064069	74.205	3381	58.1464
8.151	74.205	3097	55.6507
8.237932	74.205	3071	55.4166
8.324864	74.205	2935	54.1756
8.411795	74.205	2916	54
8.498727	74.205	2902	53.8702
8.585658	74.205	2921	54.0463
8.67259	74.205	2634	51.3225
8.759521	74.205	2707	52.0288
8.846453	74.205	2531	50.309
8.933384	74.205	2599	50.9804
9.020316	74.205	2467	49.6689
9.107247	74.205	2538	50.3786
9.194179	74.205	2527	50.2693
9.28111	74.205	2540	50.3984
9.368042	74.205	2735	52.2972
9.454973	74.205	2896	53.8145
9.541905	74.205	3564	59.6992
9.628836	74.205	4096	64
9.715768	74.205	3854	62.0806

9.802699	74.205	3923	62.6339
9.889631	74.205	3119	55.848
9.976562	74.205	2514	50.1398
10.06349	74.205	2369	48.6724
10.15043	74.205	2478	49.7795
10.23736	74.205	2259	47.5289
10.32429	74.205	2298	47.9375
10.41122	74.205	2273	47.676
10.49815	74.205	2379	48.775
10.58508	74.205	2376	48.7442
10.67201	74.205	2336	48.3322
10.75895	74.205	2500	50
10.84588	74.205	2291	47.8644
10.93281	74.205	2242	47.3498
11.01974	74.205	2273	47.676
11.10667	74.205	2025	45
11.1936	74.205	2165	46.5296
11.28054	74.205	2278	47.7284
11.36747	74.205	2411	49.1019
11.4544	74.205	2357	48.5489
11.54133	74.205	2144	46.3033
11.62826	74.205	2023	44.9778
11.71519	74.205	2008	44.8107
11.80212	74.205	2058	45.3652
11.88906	74.205	2052	45.299
11.97599	74.205	1940	44.0454
12.06292	74.205	2092	45.7384
12.14985	74.205	2083	45.6399
12.23678	74.205	2073	45.5302
12.32371	74.205	2025	45
12.41064	74.205	2108	45.913
12.49758	74.205	2144	46.3033
12.58451	74.205	2426	49.2544
12.67144	74.205	2832	53.2165
12.75837	74.205	3742	61.1719
12.8453	74.205	5520	74.2967
12.93223	74.205	8678	93.1558
13.01917	74.205	9065	95.2103
13.1061	74.205	4414	66.4379
13.19303	74.205	2623	51.2152
13.27996	74.205	2279	47.7389

13.36689	74.205	2306	48.0208
13.45382	74.205	2487	49.8698
13.54075	74.205	2799	52.9056
13.62769	74.205	2487	49.8698
13.71462	74.205	2171	46.594
13.80155	74.205	2108	45.913
13.88848	74.205	2010	44.833
13.97541	74.205	2112	45.9565
14.06234	74.205	2056	45.3431
14.14928	74.205	2012	44.8553
14.23621	74.205	2016	44.8999
14.32314	74.205	2058	45.3652
14.41007	74.205	2140	46.2601
14.497	74.205	2327	48.239
14.58393	74.205	2381	48.7955
14.67086	74.205	2401	49
14.7578	74.205	2687	51.8363
14.84473	74.205	3618	60.1498
14.93166	74.205	4853	69.6635
15.01859	74.205	4590	67.7495
15.10552	74.205	2822	53.1225
15.19245	74.205	2290	47.8539
15.27939	74.205	2132	46.1736
15.36632	74.205	1935	43.9886
15.45325	74.205	2078	45.5851
15.54018	74.205	2070	45.4973
15.62711	74.205	2006	44.7884
15.71404	74.205	2099	45.8148
15.80097	74.205	2051	45.288
15.88791	74.205	2055	45.3321
15.97484	74.205	2121	46.0543
16.06177	74.205	2316	48.1248
16.1487	74.205	2355	48.5283
16.23563	74.205	2190	46.7974
16.32256	74.205	2000	44.7214
16.40949	74.205	2103	45.8585
16.49643	74.205	2104	45.8694
16.58336	74.205	2176	46.6476
16.67029	74.205	2235	47.2758
16.75722	74.205	2175	46.6369
16.84415	74.205	2054	45.3211

16.93108	74.205	2120	46.0435
17.01802	74.205	2184	46.7333
17.10495	74.205	2333	48.3011
17.19188	74.205	2392	48.9081
17.27881	74.205	2492	49.9199
17.36574	74.205	2508	50.0799
17.45267	74.205	2483	49.8297
17.5396	74.205	2594	50.9313
17.62654	74.205	2549	50.4876
17.71347	74.205	2335	48.3218
17.8004	74.205	2119	46.0326
17.88733	74.205	2268	47.6235
17.97426	74.205	2295	47.9062
18.06119	74.205	2189	46.7868
18.14813	74.205	2247	47.4025
18.23506	74.205	2272	47.6655
18.32199	74.205	2285	47.8017
18.40892	74.205	2466	49.6588
18.49585	74.205	2422	49.2138
18.58278	74.205	2379	48.775
18.66971	74.205	2452	49.5177
18.75665	74.205	2533	50.3289
18.84358	74.205	2532	50.319
18.93051	74.205	2608	51.0686
19.01744	74.205	2689	51.8556
19.10437	74.205	2782	52.7447
19.1913	74.205	2862	53.4977
19.27824	74.205	2864	53.5164
19.36517	74.205	2920	54.037
19.4521	74.205	3453	58.7622
19.53903	74.205	4640	68.1175
19.62596	74.205	7866	88.6905
19.71289	74.205	13594	116.5933
19.79982	74.205	17313	131.5789
19.88676	74.205	10632	103.1116
19.97369	74.205	4919	70.1356
20.06062	74.205	3633	60.2744
20.14755	74.205	3579	59.8247
20.23448	74.205	3471	58.9152
20.32141	74.205	3116	55.8211
20.40834	74.205	3178	56.3738

20.49528	74.205	3150	56.1249
20.58221	74.205	3422	58.4979
20.66914	74.205	3705	60.8687
20.75607	74.205	4048	63.6239
20.843	74.205	4354	65.9848
20.92993	74.205	4982	70.5833
21.01687	74.205	5956	77.1751
21.1038	74.205	8596	92.7146
21.19073	74.205	13725	117.1537
21.27766	74.205	18684	136.6894
21.36459	74.205	15418	124.1692
21.45152	74.205	7932	89.0618
21.53845	74.205	5422	73.6342
21.62539	74.205	4570	67.6018
21.71232	74.205	4220	64.9615
21.79925	74.205	4188	64.7148
21.88618	74.205	4341	65.8863
21.97311	74.205	4567	67.5796
22.06004	74.205	4849	69.6348
22.14698	74.205	5574	74.6592
22.23391	74.205	8011	89.5042
22.32084	74.205	13656	116.8589
22.40777	74.205	22996	151.6443
22.4947	74.205	28413	168.5616
22.58163	74.205	19050	138.0217
22.66856	74.205	9689	98.4327
22.7555	74.205	5968	77.2528
22.84243	74.205	4943	70.3065
22.92936	74.205	4662	68.2788
23.01629	74.205	4479	66.9253
23.10322	74.205	4040	63.561
23.19015	74.205	3732	61.0901
23.27708	74.205	3670	60.5805
23.36402	74.205	3628	60.2329
23.45095	74.205	3702	60.8441
23.53788	74.205	3474	58.9406
23.62481	74.205	3331	57.7148
23.71174	74.205	3236	56.8859
23.79867	74.205	3235	56.8771
23.88561	74.205	3307	57.5065
23.97254	74.205	3225	56.7891

24.05947	74.205	3222	56.7627
24.1464	74.205	3331	57.7148
24.23333	74.205	3390	58.2237
24.32026	74.205	3411	58.4038
24.40719	74.205	3421	58.4893
24.49413	74.205	3318	57.6021
24.58106	74.205	3468	58.8897
24.66799	74.205	3317	57.5934
24.75492	74.205	3568	59.7327
24.84185	74.205	3896	62.4179
24.92878	74.205	4294	65.5286
25.01572	74.205	3947	62.8252
25.10265	74.205	3414	58.4294
25.18958	74.205	3364	58
25.27651	74.205	3235	56.8771
25.36344	74.205	3238	56.9034
25.45037	74.205	3328	57.6888
25.5373	74.205	3446	58.7026
25.62424	74.205	3930	62.6897
25.71117	74.205	4674	68.3667
25.7981	74.205	6851	82.7708
25.88503	74.205	10371	101.8381
25.97196	74.205	11320	106.3955
26.05889	74.205	7410	86.0814
26.14583	74.205	4602	67.838
26.23276	74.205	4070	63.7966
26.31969	74.205	4089	63.9453
26.40662	74.205	3646	60.3821
26.49355	74.205	3289	57.3498
26.58048	74.205	3175	56.3471
26.66741	74.205	2984	54.626
26.75435	74.205	3092	55.6058
26.84128	74.205	3027	55.0182
26.92821	74.205	3068	55.3895
27.01514	74.205	3200	56.5685
27.10207	74.205	3318	57.6021
27.189	74.205	3334	57.7408
27.27593	74.205	3562	59.6825
27.36287	74.205	3244	56.9561
27.4498	74.205	3091	55.5968
27.53673	74.205	2910	53.9444

27.62366	74.205	2973	54.5252
27.71059	74.205	2978	54.5711
27.79752	74.205	2899	53.8424
27.88446	74.205	2887	53.7308
27.97139	74.205	2807	52.9811
28.05832	74.205	2757	52.5071
28.14525	74.205	2741	52.3546
28.23218	74.205	2884	53.7029
28.31911	74.205	2900	53.8516
28.40604	74.205	2978	54.5711
28.49298	74.205	3185	56.4358
28.57991	74.205	2903	53.8795
28.66684	74.205	2887	53.7308
28.75377	74.205	2983	54.6168
28.8407	74.205	3303	57.4717
28.92763	74.205	4236	65.0846
29.01457	74.205	5738	75.7496
29.1015	74.205	6956	83.4026
29.18843	74.205	6022	77.6015
29.27536	74.205	4272	65.3605
29.36229	74.205	3439	58.643
29.44922	74.205	3169	56.2939
29.53615	74.205	3072	55.4256
29.62309	74.205	2984	54.626
29.71002	74.205	3123	55.8838
29.79695	74.205	3718	60.9754
29.88388	74.205	5313	72.8903
29.97081	74.205	7185	84.7644
30.05774	74.205	7073	84.1011
30.14468	74.205	5012	70.7955
30.23161	74.205	3311	57.5413
30.31854	74.205	2792	52.8394
30.40547	74.205	2664	51.614
30.4924	74.205	2656	51.5364
30.57933	74.205	2688	51.8459
30.66626	74.205	2703	51.9904
30.7532	74.205	2774	52.6688
30.84013	74.205	2911	53.9537
30.92706	74.205	2932	54.1479
31.01399	74.205	3009	54.8544
31.10092	74.205	2837	53.2635

31.18785	74.205	2692	51.8845
31.27478	74.205	2500	50
31.36172	74.205	2400	48.9898
31.44865	74.205	2487	49.8698
31.53558	74.205	2702	51.9808
31.62251	74.205	2595	50.9411
31.70944	74.205	2538	50.3786
31.79637	74.205	2703	51.9904
31.88331	74.205	2710	52.0577
31.97024	74.205	2729	52.2398
32.05717	74.205	2481	49.8096
32.1441	74.205	2256	47.4974
32.23103	74.205	2163	46.5081
32.31796	74.205	2187	46.7654
32.40489	74.205	2205	46.9574
32.49183	74.205	2260	47.5395
32.57876	74.205	2099	45.8148
32.66569	74.205	2197	46.8722
32.75262	74.205	2182	46.7119
32.83955	74.205	2200	46.9042
32.92648	74.205	2384	48.8262
33.01342	74.205	2488	49.8799
33.10035	74.205	2373	48.7134
33.18728	74.205	2493	49.93
33.27421	74.205	2578	50.774
33.36114	74.205	2736	52.3068
33.44807	74.205	3148	56.107
33.535	74.205	3879	62.2816
33.62194	74.205	4968	70.484
33.70887	74.205	5693	75.452
33.7958	74.205	6431	80.1935
33.88273	74.205	6829	82.6378
33.96966	74.205	6254	79.0822
34.05659	74.205	5060	71.1337
34.14352	74.205	3890	62.3699
34.23046	74.205	3592	59.9333
34.31739	74.205	4123	64.2106
34.40432	74.205	5748	75.8156
34.49125	74.205	6513	80.7032
34.57818	74.205	5140	71.6938
34.66511	74.205	3550	59.5819

34.75205	74.205	2856	53.4416
34.83898	74.205	2396	48.949
34.92591	74.205	2133	46.1844
35.01284	74.205	2062	45.4093
35.09977	74.205	2069	45.4863
35.1867	74.205	2073	45.5302
35.27363	74.205	2038	45.1442
35.36057	74.205	2092	45.7384
35.4475	74.205	1965	44.3283
35.53443	74.205	1999	44.7102
35.62136	74.205	1983	44.5309
35.70829	74.205	1922	43.8406
35.79522	74.205	1965	44.3283
35.88216	74.205	1813	42.5793
35.96909	74.205	1864	43.1741
36.05602	74.205	1823	42.6966
36.14295	74.205	1806	42.4971
36.22988	74.205	1718	41.4488
36.31681	74.205	1827	42.7434
36.40374	74.205	1891	43.4856
36.49068	74.205	1793	42.3438
36.57761	74.205	1850	43.0116
36.66454	74.205	1892	43.4971
36.75147	74.205	1968	44.3621
36.8384	74.205	2147	46.3357
36.92533	74.205	2651	51.4879
37.01227	74.205	2874	53.6097
37.0992	74.205	2670	51.672
37.18613	74.205	2207	46.9787
37.27306	74.205	1924	43.8634
37.35999	74.205	1997	44.6878
37.44692	74.205	1921	43.8292
37.53385	74.205	1938	44.0227
37.62079	74.205	2214	47.0532
37.70772	74.205	2821	53.1131
37.79465	74.205	3575	59.7913
37.88158	74.205	4464	66.8132
37.96851	74.205	4179	64.6452
38.05544	74.205	2939	54.2125
38.14237	74.205	2163	46.5081
38.22931	74.205	1834	42.8252

38.31624	74.205	1875	43.3013
38.40317	74.205	1778	42.1663
38.4901	74.205	1777	42.1545
38.57703	74.205	1773	42.107
38.66396	74.205	1727	41.5572
38.7509	74.205	1736	41.6653
38.83783	74.205	1755	41.8927
38.92476	74.205	1707	41.3159
39.01169	74.205	1679	40.9756
39.09862	74.205	1726	41.5452
39.18555	74.205	1721	41.4849
39.27248	74.205	1787	42.2729
39.35942	74.205	1786	42.2611
39.44635	74.205	1806	42.4971
39.53328	74.205	1834	42.8252
39.62021	74.205	1686	41.0609
39.70714	74.205	1770	42.0714
39.79407	74.205	1725	41.5331
39.88101	74.205	1693	41.1461
39.96794	74.205	1679	40.9756
40.05487	74.205	1757	41.9166
40.1418	74.205	1833	42.8135
40.22873	74.205	1873	43.2782
40.31566	74.205	1789	42.2966
40.40259	74.205	1739	41.7013
40.48953	74.205	1676	40.939
40.57646	74.205	1751	41.845
40.66339	74.205	1844	42.9418
40.75032	74.205	1947	44.1248
40.83725	74.205	2031	45.0666
40.92418	74.205	1830	42.7785
41.01112	74.205	1794	42.3556
41.09805	74.205	1703	41.2674
41.18498	74.205	1778	42.1663
41.27191	74.205	1790	42.3084
41.35884	74.205	2071	45.5082
41.44577	74.205	2327	48.239
41.5327	74.205	2219	47.1063
41.61964	74.205	2211	47.0213
41.70657	74.205	2133	46.1844
41.7935	74.205	2160	46.4758

41.88043	74.205	2242	47.3498
41.96736	74.205	2448	49.4773
42.05429	74.205	2599	50.9804
42.14122	74.205	2664	51.614
42.22816	74.205	2591	50.9019
42.31509	74.205	2702	51.9808
42.40202	74.205	2500	50
42.48895	74.205	2166	46.5403
42.57588	74.205	1895	43.5316
42.66281	74.205	1809	42.5323
42.74975	74.205	1809	42.5323
42.83668	74.205	1778	42.1663
42.92361	74.205	1851	43.0232
43.01054	74.205	2028	45.0333
43.09747	74.205	2170	46.5833
43.1844	74.205	2170	46.5833
43.27133	74.205	1983	44.5309
43.35827	74.205	1767	42.0357
43.4452	74.205	1823	42.6966
43.53213	74.205	1907	43.6692
43.61906	74.205	2039	45.1553
43.70599	74.205	2096	45.7821
43.79292	74.205	1906	43.6578
43.87986	74.205	1765	42.0119
43.96679	74.205	1765	42.0119
44.05372	74.205	1561	39.5095
44.14065	74.205	1506	38.8072
44.22758	74.205	1535	39.1791
44.31451	74.205	1513	38.8973
44.40144	74.205	1601	40.0125
44.48838	74.205	1528	39.0896
44.57531	74.205	1623	40.2865
44.66224	74.205	1645	40.5586
44.74917	74.205	1687	41.0731
44.8361	74.205	1724	41.5211
44.92303	74.205	1785	42.2493
45.00996	74.205	1853	43.0465
45.0969	74.205	1829	42.7668
45.18383	74.205	1715	41.4126
45.27076	74.205	1641	40.5093
45.35769	74.205	1541	39.2556

45.44462	74.205	1535	39.1791
45.53155	74.205	1674	40.9145
45.61849	74.205	1737	41.6773
45.70542	74.205	1709	41.3401
45.79235	74.205	1591	39.8873
45.87928	74.205	1610	40.1248
45.96621	74.205	1476	38.4187
46.05314	74.205	1588	39.8497
46.14007	74.205	1468	38.3145
46.22701	74.205	1504	38.7814
46.31394	74.205	1520	38.9872
46.40087	74.205	1630	40.3733
46.4878	74.205	1574	39.6737
46.57473	74.205	1646	40.5709
46.66166	74.205	1485	38.5357
46.7486	74.205	1484	38.5227
46.83553	74.205	1523	39.0256
46.92246	74.205	1464	38.2623
47.00939	74.205	1547	39.3319
47.09632	74.205	1429	37.8021
47.18325	74.205	1586	39.8246
47.27018	74.205	1660	40.7431
47.35712	74.205	1870	43.2435
47.44405	74.205	2107	45.9021
47.53098	74.205	2618	51.1664
47.61791	74.205	2759	52.5262
47.70484	74.205	2588	50.8724
47.79177	74.205	2219	47.1063
47.87871	74.205	2004	44.7661
47.96564	74.205	1973	44.4185
48.05257	74.205	1873	43.2782
48.1395	74.205	1734	41.6413
48.22643	74.205	1631	40.3856
48.31336	74.205	1462	38.2361
48.40029	74.205	1440	37.9473
48.48723	74.205	1441	37.9605
48.57416	74.205	1454	38.1314
48.66109	74.205	1450	38.0789
48.74802	74.205	1387	37.2424
48.83495	74.205	1474	38.3927
48.92188	74.205	1553	39.4081

49.00881	74.205	1484	38.5227
49.09575	74.205	1463	38.2492
49.18268	74.205	1500	38.7298
49.26961	74.205	1588	39.8497
49.35654	74.205	1603	40.0375
49.44347	74.205	1651	40.6325
49.5304	74.205	1609	40.1123
49.61734	74.205	1639	40.4846
49.70427	74.205	1537	39.2046
49.7912	74.205	1473	38.3797
49.87813	74.205	1456	38.1576
49.96506	74.205	1477	38.4318
50.05199	74.205	1476	38.4187
50.13892	74.205	1400	37.4166
50.22586	74.205	1417	37.6431
50.31279	74.205	1429	37.8021
50.39972	74.205	1374	37.0675
50.48665	74.205	1493	38.6394
50.57358	74.205	1488	38.5746
50.66051	74.205	1538	39.2173
50.74745	74.205	1478	38.4448
50.83438	74.205	1571	39.6358
50.92131	74.205	1565	39.5601
51.00824	74.205	1539	39.2301
51.09517	74.205	1589	39.8623
51.1821	74.205	1630	40.3733
51.26903	74.205	1819	42.6497
51.35597	74.205	1840	42.8952
51.4429	74.205	1781	42.2019
51.52983	74.205	1637	40.4599
51.61676	74.205	1515	38.923
51.70369	74.205	1524	39.0384
51.79062	74.205	1573	39.6611
51.87756	74.205	1728	41.5692
51.96449	74.205	1755	41.8927
52.05142	74.205	1856	43.0813
52.13835	74.205	1784	42.2374
52.22528	74.205	1721	41.4849
52.31221	74.205	1610	40.1248
52.39914	74.205	1587	39.8372
52.48608	74.205	1573	39.6611

52.57301	74.205	1706	41.3038
52.65994	74.205	1719	41.4608
52.74687	74.205	1557	39.4588
52.8338	74.205	1644	40.5463
52.92073	74.205	1576	39.6989
53.00766	74.205	1564	39.5474
53.0946	74.205	1543	39.281
53.18153	74.205	1584	39.7995
53.26846	74.205	1605	40.0625
53.35539	74.205	1455	38.1445
53.44232	74.205	1453	38.1182
53.52925	74.205	1420	37.6829
53.61619	74.205	1533	39.1535
53.70312	74.205	1547	39.3319
53.79005	74.205	1515	38.923
53.87698	74.205	1548	39.3446
53.96391	74.205	1577	39.7115
54.05084	74.205	1555	39.4335
54.13777	74.205	1576	39.6989
54.22471	74.205	1546	39.3192
54.31164	74.205	1621	40.2616
54.39857	74.205	1696	41.1825
54.4855	74.205	1833	42.8135
54.57243	74.205	2047	45.2438
54.65936	74.205	2153	46.4004
54.7463	74.205	2151	46.3789
54.83323	74.205	2114	45.9783
54.92016	74.205	1991	44.6206
55.00709	74.205	1781	42.2019
55.09402	74.205	1757	41.9166
55.18095	74.205	1729	41.5812
55.26788	74.205	1703	41.2674
55.35482	74.205	1883	43.3935
55.44175	74.205	2003	44.7549
55.52868	74.205	2071	45.5082
55.61561	74.205	1858	43.1045
55.70254	74.205	1742	41.7373
55.78947	74.205	1774	42.1189
55.8764	74.205	1546	39.3192
55.96334	74.205	1508	38.833
56.05027	74.205	1413	37.5899

56.1372	74.205	1489	38.5876
56.22413	74.205	1433	37.855
56.31106	74.205	1444	38
56.39799	74.205	1448	38.0526
56.48493	74.205	1565	39.5601
56.57186	74.205	1737	41.6773
56.65879	74.205	1759	41.9404
56.74572	74.205	1733	41.6293
56.83265	74.205	1607	40.0874
56.91958	74.205	1576	39.6989
57.00651	74.205	1468	38.3145
57.09345	74.205	1607	40.0874
57.18038	74.205	1614	40.1746
57.26731	74.205	1824	42.7083
57.35424	74.205	1870	43.2435
57.44117	74.205	1667	40.8289
57.5281	74.205	1539	39.2301
57.61504	74.205	1493	38.6394
57.70197	74.205	1469	38.3275
57.7889	74.205	1414	37.6032
57.87583	74.205	1472	38.3667
57.96276	74.205	1450	38.0789
58.04969	74.205	1527	39.0768
58.13662	74.205	1654	40.6694
58.22356	74.205	1719	41.4608
58.31049	74.205	1916	43.7721
58.39742	74.205	1932	43.9545
58.48435	74.205	2240	47.3286
58.57128	74.205	2270	47.6445
58.65821	74.205	2447	49.4672
58.74515	74.205	2473	49.7293
58.83208	74.205	2139	46.2493
58.91901	74.205	1764	42
59.00594	74.205	1575	39.6863
59.09287	74.205	1557	39.4588
59.1798	74.205	1445	38.0132
59.26673	74.205	1334	36.524
59.35367	74.205	1390	37.2827
59.4406	74.205	1477	38.4318
59.52753	74.205	1543	39.281
59.61446	74.205	1544	39.2938

59.70139	74.205	1547	39.3319
59.78832	74.205	1580	39.7492
59.87525	74.205	1831	42.7902
59.96219	74.205	2056	45.3431
60.04912	74.205	2118	46.0217
60.13605	74.205	2335	48.3218
60.22298	74.205	2186	46.7547
60.30991	74.205	2011	44.8442
60.39684	74.205	2003	44.7549
60.48378	74.205	2059	45.3762
60.57071	74.205	2259	47.5289
60.65764	74.205	2336	48.3322
60.74457	74.205	2243	47.3603
60.8315	74.205	2029	45.0444
60.91843	74.205	1786	42.2611
61.00536	74.205	1653	40.6571
61.0923	74.205	1574	39.6737
61.17923	74.205	1543	39.281
61.26616	74.205	1384	37.2022
61.35309	74.205	1533	39.1535
61.44002	74.205	1461	38.223
61.52695	74.205	1460	38.2099
61.61389	74.205	1463	38.2492
61.70082	74.205	1467	38.3014
61.78775	74.205	1556	39.4462
61.87468	74.205	1609	40.1123
61.96161	74.205	1603	40.0375
62.04854	74.205	1551	39.3827
62.13547	74.205	1531	39.128
62.22241	74.205	1368	36.9865
62.30934	74.205	1344	36.6606
62.39627	74.205	1374	37.0675
62.4832	74.205	1390	37.2827
62.57013	74.205	1481	38.4838
62.65706	74.205	1468	38.3145
62.744	74.205	1490	38.6005
62.83093	74.205	1459	38.1969
62.91786	74.205	1546	39.3192
63.00479	74.205	1433	37.855
63.09172	74.205	1382	37.1753
63.17865	74.205	1358	36.8511

63.26558	74.205	1313	36.2353
63.35252	74.205	1317	36.2905
63.43945	74.205	1355	36.8103
63.52638	74.205	1297	36.0139
63.61331	74.205	1271	35.6511
63.70024	74.205	1382	37.1753
63.78717	74.205	1301	36.0694
63.8741	74.205	1381	37.1618
63.96104	74.205	1426	37.7624
64.04797	74.205	1406	37.4967
64.1349	74.205	1376	37.0945
64.22183	74.205	1342	36.6333
64.30876	74.205	1328	36.4417
64.39569	74.205	1314	36.2491
64.48263	74.205	1433	37.855
64.56956	74.205	1357	36.8375
64.65649	74.205	1412	37.5766
64.74342	74.205	1427	37.7757
64.83035	74.205	1465	38.2753
64.91728	74.205	1470	38.3406
65.00421	74.205	1487	38.5616
65.09115	74.205	1458	38.1838
65.17808	74.205	1525	39.0512
65.26501	74.205	1615	40.1871
65.35194	74.205	1765	42.0119
65.43887	74.205	1884	43.4051
65.5258	74.205	1819	42.6497
65.61274	74.205	1804	42.4735
65.69967	74.205	1613	40.1622
65.7866	74.205	1511	38.8716
65.87353	74.205	1430	37.8153
65.96046	74.205	1397	37.3765
66.04739	74.205	1383	37.1887
66.13432	74.205	1314	36.2491
66.22126	74.205	1400	37.4166
66.30819	74.205	1443	37.9868
66.39512	74.205	1399	37.4032
66.48205	74.205	1340	36.606
66.56898	74.205	1374	37.0675
66.65591	74.205	1342	36.6333
66.74284	74.205	1374	37.0675

66.82978	74.205	1359	36.8646
66.91671	74.205	1363	36.9188
67.00364	74.205	1381	37.1618
67.09057	74.205	1318	36.3043
67.1775	74.205	1355	36.8103
67.26443	74.205	1267	35.5949
67.35137	74.205	1278	35.7491
67.4383	74.205	1386	37.229
67.52523	74.205	1359	36.8646
67.61216	74.205	1474	38.3927
67.69909	74.205	1467	38.3014
67.78602	74.205	1500	38.7298
67.87295	74.205	1655	40.6817
67.95989	74.205	1737	41.6773
68.04682	74.205	1729	41.5812
68.13375	74.205	1627	40.3361
68.22068	74.205	1551	39.3827
68.30761	74.205	1448	38.0526
68.39454	74.205	1401	37.4299
68.48148	74.205	1372	37.0405
68.56841	74.205	1370	37.0135
68.65534	74.205	1308	36.1663
68.74227	74.205	1340	36.606
68.8292	74.205	1333	36.5103
68.91613	74.205	1324	36.3868
69.00306	74.205	1228	35.0428
69.09	74.205	1317	36.2905
69.17693	74.205	1274	35.6931
69.26386	74.205	1333	36.5103
69.35079	74.205	1242	35.242
69.43772	74.205	1338	36.5787
69.52465	74.205	1386	37.229
69.61159	74.205	1308	36.1663
69.69852	74.205	1435	37.8814
69.78545	74.205	1402	37.4433
69.87238	74.205	1264	35.5528
69.95931	74.205	1267	35.5949
70.04624	74.205	1316	36.2767
70.13317	74.205	1309	36.1801
70.22011	74.205	1364	36.9324
70.30704	74.205	1317	36.2905

70.39397	74.205	1358	36.8511
70.4809	74.205	1386	37.229
70.56783	74.205	1430	37.8153
70.65476	74.205	1434	37.8682
70.74169	74.205	1527	39.0768
70.82863	74.205	1682	41.0122
70.91556	74.205	1741	41.7253
71.00249	74.205	1790	42.3084
71.08942	74.205	1913	43.7379
71.17635	74.205	1904	43.6348
71.26328	74.205	1968	44.3621
71.35022	74.205	1859	43.1161
71.43715	74.205	1721	41.4849
71.52408	74.205	1636	40.4475
71.61101	74.205	1490	38.6005
71.69794	74.205	1391	37.2961
71.78487	74.205	1382	37.1753
71.8718	74.205	1492	38.6264
71.95874	74.205	1593	39.9124
72.04567	74.205	1601	40.0125
72.1326	74.205	1540	39.2428
72.21953	74.205	1512	38.8844
72.30646	74.205	1406	37.4967
72.39339	74.205	1366	36.9594
72.48033	74.205	1350	36.7423
72.56726	74.205	1336	36.5513
72.65419	74.205	1346	36.6879
72.74112	74.205	1321	36.3456
72.82805	74.205	1301	36.0694
72.91498	74.205	1309	36.1801
73.00191	74.205	1312	36.2215
73.08885	74.205	1307	36.1525
73.17578	74.205	1253	35.3977
73.26271	74.205	1219	34.9142
73.34964	74.205	1157	34.0147
73.43657	74.205	1196	34.5832
73.5235	74.205	1110	33.3167
73.61044	74.205	1175	34.2783
73.69737	74.205	1129	33.6006
73.7843	74.205	1205	34.7131
73.87123	74.205	1202	34.6699

73.95816	74.205	1167	34.1614
74.04509	74.205	1186	34.4384
74.13202	74.205	1237	35.171
74.21896	74.205	1274	35.6931
74.30589	74.205	1304	36.1109
74.39282	74.205	1214	34.8425
74.47975	74.205	1161	34.0735
74.56668	74.205	1202	34.6699
74.65361	74.205	1210	34.7851
74.74054	74.205	1179	34.3366
74.82748	74.205	1228	35.0428
74.91441	74.205	1267	35.5949
75.00134	74.205	1290	35.9166
75.08827	74.205	1285	35.8469
75.1752	74.205	1323	36.3731
75.26213	74.205	1283	35.819
75.34907	74.205	1264	35.5528
75.436	74.205	1235	35.1426
75.52293	74.205	1128	33.5857
75.60986	74.205	1134	33.6749
75.69679	74.205	1094	33.0757
75.78372	74.205	1130	33.6155
75.87065	74.205	1169	34.1906
75.95759	74.205	1089	33
76.04452	74.205	1234	35.1283
76.13145	74.205	1170	34.2053
76.21838	74.205	1123	33.5112
76.30531	74.205	1141	33.7787
76.39224	74.205	1174	34.2637
76.47918	74.205	1167	34.1614
76.56611	74.205	1158	34.0294
76.65304	74.205	1221	34.9428
76.73997	74.205	1147	33.8674
76.8269	74.205	1208	34.7563
76.91383	74.205	1253	35.3977
77.00076	74.205	1143	33.8083
77.0877	74.205	1228	35.0428
77.17463	74.205	1259	35.4824
77.26156	74.205	1273	35.6791
77.34849	74.205	1344	36.6606
77.43542	74.205	1293	35.9583

77.52235	74.205	1161	34.0735
77.60928	74.205	1154	33.9706
77.69622	74.205	1074	32.7719
77.78315	74.205	1075	32.7872
77.87008	74.205	1032	32.1248
77.95701	74.205	1080	32.8634
78.04394	74.205	1069	32.6956
78.13087	74.205	1057	32.5115
78.21781	74.205	996	31.5595
78.30474	74.205	952	30.8545
78.39167	74.205	1089	33
78.4786	74.205	1068	32.6803
78.56553	74.205	1047	32.3574
78.65246	74.205	1145	33.8378
78.73939	74.205	1180	34.3511
78.82633	74.205	1233	35.1141
78.91326	74.205	1207	34.7419
79.00019	74.205	1200	34.641
79.08712	74.205	1208	34.7563
79.17405	74.205	1168	34.176
79.26098	74.205	1140	33.7639
79.34792	74.205	1058	32.5269
79.43485	74.205	1060	32.5576
79.52178	74.205	1055	32.4808
79.60871	74.205	1013	31.8277
79.69564	74.205	1048	32.3728
79.78257	74.205	1112	33.3467
79.8695	74.205	1071	32.7261
79.95644	74.205	1014	31.8434

[Measurement conditions]			
Sample identification	$AlPO_4$-5		
Comment			
Anode material	Cu		
K-Alpha1 wavelength	1.540598		
K-Alpha2 wavelength	1.544426		
Ratio K-Alpha2/K-Alpha1	0.5		
Divergence slit	Fixed	0.76mm	
Monochromator used	NO		
Generator voltage	40		
Tube current	15		
File date and time	########		
Unit cell			
h k l	0 0 0		
Scan axis	Gonio		
Scan range	4.978	79.9999	
Scan step size	0.086932		
No. of points	863		
Scan type	CONTINUOUS		
Time per step	74.205		
[Scan points]			
Angle	TimePerStep	Intensity	ESD
5.021466	74.205	6980	83.5464
5.108397	74.205	6788	82.3893
5.195329	74.205	6425	80.1561
5.28226	74.205	6253	79.0759
5.369192	74.205	5936	77.0454
5.456123	74.205	5725	75.6637
5.543055	74.205	5489	74.0878
5.629986	74.205	5329	73
5.716918	74.205	5263	72.5465
5.803849	74.205	5199	72.1041
5.890781	74.205	5088	71.3302
5.977712	74.205	4798	69.2676
6.064644	74.205	4404	66.3626
6.151576	74.205	4022	63.4192

6.238507	74.205	3657	60.4731
6.325439	74.205	3488	59.0593
6.41237	74.205	3439	58.643
6.499302	74.205	3459	58.8133
6.586233	74.205	3373	58.0775
6.673165	74.205	3547	59.5567
6.760096	74.205	3833	61.9112
6.847028	74.205	4273	65.3682
6.933959	74.205	4851	69.6491
7.020891	74.205	5754	75.8551
7.107822	74.205	7549	86.885
7.194754	74.205	10466	102.3035
7.281685	74.205	15538	124.6515
7.368617	74.205	24353	156.0545
7.455548	74.205	40320	200.7984
7.54248	74.205	68033	260.8314
7.629411	74.205	65640	256.203
7.716343	74.205	23560	153.4927
7.803274	74.205	7137	84.4808
7.890206	74.205	4510	67.1565
7.977137	74.205	3647	60.3904
8.064069	74.205	3209	56.648
8.151	74.205	2901	53.8609
8.237932	74.205	2753	52.469
8.324864	74.205	2688	51.8459
8.411795	74.205	2631	51.2933
8.498727	74.205	2635	51.3323
8.585658	74.205	2679	51.7591
8.67259	74.205	2506	50.06
8.759521	74.205	2376	48.7442
8.846453	74.205	2258	47.5184
8.933384	74.205	2412	49.1121
9.020316	74.205	2281	47.7598
9.107247	74.205	2223	47.1487
9.194179	74.205	2157	46.4435
9.28111	74.205	2091	45.7275
9.368042	74.205	2110	45.9347
9.454973	74.205	2023	44.9778
9.541905	74.205	2092	45.7384
9.628836	74.205	2026	45.0111
9.715768	74.205	2114	45.9783

9.802699	74.205	1953	44.1928
9.889631	74.205	1998	44.699
9.976562	74.205	1935	43.9886
10.06349	74.205	2058	45.3652
10.15043	74.205	1881	43.3705
10.23736	74.205	1978	44.4747
10.32429	74.205	2028	45.0333
10.41122	74.205	1964	44.317
10.49815	74.205	1926	43.8862
10.58508	74.205	1912	43.7264
10.67201	74.205	1848	42.9884
10.75895	74.205	1866	43.1972
10.84588	74.205	1818	42.638
10.93281	74.205	1875	43.3013
11.01974	74.205	1808	42.5206
11.10667	74.205	1898	43.566
11.1936	74.205	1682	41.0122
11.28054	74.205	1806	42.4971
11.36747	74.205	1720	41.4729
11.4544	74.205	1705	41.2916
11.54133	74.205	1723	41.509
11.62826	74.205	1764	42
11.71519	74.205	1742	41.7373
11.80212	74.205	1716	41.4246
11.88906	74.205	1609	40.1123
11.97599	74.205	1717	41.4367
12.06292	74.205	1564	39.5474
12.14985	74.205	1715	41.4126
12.23678	74.205	1689	41.0974
12.32371	74.205	1714	41.4005
12.41064	74.205	1818	42.638
12.49758	74.205	1930	43.9318
12.58451	74.205	2195	46.8508
12.67144	74.205	2751	52.45
12.75837	74.205	4012	63.3404
12.8453	74.205	7034	83.8689
12.93223	74.205	12145	110.2044
13.01917	74.205	13854	117.703
13.1061	74.205	6520	80.7465
13.19303	74.205	2776	52.6878
13.27996	74.205	1966	44.3396

13.36689	74.205	1781	42.2019
13.45382	74.205	1870	43.2435
13.54075	74.205	1768	42.0476
13.62769	74.205	1802	42.45
13.71462	74.205	1661	40.7554
13.80155	74.205	1531	39.128
13.88848	74.205	1593	39.9124
13.97541	74.205	1595	39.9375
14.06234	74.205	1549	39.3573
14.14928	74.205	1541	39.2556
14.23621	74.205	1523	39.0256
14.32314	74.205	1555	39.4335
14.41007	74.205	1600	40
14.497	74.205	1520	38.9872
14.58393	74.205	1674	40.9145
14.67086	74.205	1924	43.8634
14.7578	74.205	2519	50.1896
14.84473	74.205	3887	62.3458
14.93166	74.205	6107	78.1473
15.01859	74.205	5792	76.1052
15.10552	74.205	3130	55.9464
15.19245	74.205	1908	43.6807
15.27939	74.205	1548	39.3446
15.36632	74.205	1495	38.6652
15.45325	74.205	1527	39.0768
15.54018	74.205	1386	37.229
15.62711	74.205	1396	37.3631
15.71404	74.205	1283	35.819
15.80097	74.205	1328	36.4417
15.88791	74.205	1381	37.1618
15.97484	74.205	1318	36.3043
16.06177	74.205	1337	36.565
16.1487	74.205	1358	36.8511
16.23563	74.205	1409	37.5366
16.32256	74.205	1391	37.2961
16.40949	74.205	1350	36.7423
16.49643	74.205	1246	35.2987
16.58336	74.205	1372	37.0405
16.67029	74.205	1272	35.6651
16.75722	74.205	1322	36.3593
16.84415	74.205	1330	36.4692

16.93108	74.205	1341	36.6197
17.01802	74.205	1253	35.3977
17.10495	74.205	1286	35.8608
17.19188	74.205	1303	36.0971
17.27881	74.205	1273	35.6791
17.36574	74.205	1288	35.8887
17.45267	74.205	1313	36.2353
17.5396	74.205	1281	35.7911
17.62654	74.205	1295	35.9861
17.71347	74.205	1374	37.0675
17.8004	74.205	1284	35.8329
17.88733	74.205	1344	36.6606
17.97426	74.205	1276	35.7211
18.06119	74.205	1330	36.4692
18.14813	74.205	1300	36.0555
18.23506	74.205	1318	36.3043
18.32199	74.205	1279	35.7631
18.40892	74.205	1338	36.5787
18.49585	74.205	1359	36.8646
18.58278	74.205	1355	36.8103
18.66971	74.205	1502	38.7556
18.75665	74.205	1624	40.2989
18.84358	74.205	1778	42.1663
18.93051	74.205	1689	41.0974
19.01744	74.205	1585	39.8121
19.10437	74.205	1562	39.5221
19.1913	74.205	1764	42
19.27824	74.205	1862	43.1509
19.36517	74.205	1997	44.6878
19.4521	74.205	2720	52.1536
19.53903	74.205	4795	69.2459
19.62596	74.205	10302	101.4988
19.71289	74.205	21036	145.0379
19.79982	74.205	26940	164.1341
19.88676	74.205	15648	125.092
19.97369	74.205	5766	75.9342
20.06062	74.205	3092	55.6058
20.14755	74.205	2951	54.3231
20.23448	74.205	2613	51.1175
20.32141	74.205	2221	47.1275
20.40834	74.205	2137	46.2277

20.49528	74.205	2400	48.9898
20.58221	74.205	2601	51
20.66914	74.205	2636	51.342
20.75607	74.205	2902	53.8702
20.843	74.205	3498	59.1439
20.92993	74.205	4319	65.7191
21.01687	74.205	5880	76.6812
21.1038	74.205	10975	104.7616
21.19073	74.205	21681	147.2447
21.27766	74.205	31602	177.7695
21.36459	74.205	22988	151.6179
21.45152	74.205	9818	99.0858
21.53845	74.205	4862	69.728
21.62539	74.205	4149	64.4127
21.71232	74.205	3731	61.0819
21.79925	74.205	3322	57.6368
21.88618	74.205	3082	55.5158
21.97311	74.205	3038	55.1181
22.06004	74.205	3443	58.6771
22.14698	74.205	4651	68.1982
22.23391	74.205	8615	92.817
22.32084	74.205	19470	139.5349
22.40777	74.205	38423	196.0179
22.4947	74.205	46523	215.6919
22.58163	74.205	29462	171.645
22.66856	74.205	11928	109.2154
22.7555	74.205	5478	74.0135
22.84243	74.205	3452	58.7537
22.92936	74.205	2763	52.5642
23.01629	74.205	2362	48.6004
23.10322	74.205	2124	46.0869
23.19015	74.205	2034	45.0999
23.27708	74.205	2232	47.244
23.36402	74.205	2305	48.0104
23.45095	74.205	2349	48.4665
23.53788	74.205	1916	43.7721
23.62481	74.205	1802	42.45
23.71174	74.205	1648	40.5956
23.79867	74.205	1684	41.0366
23.88561	74.205	1507	38.8201
23.97254	74.205	1519	38.9744

24.05947	74.205	1623	40.2865
24.1464	74.205	1593	39.9124
24.23333	74.205	1528	39.0896
24.32026	74.205	1528	39.0896
24.40719	74.205	1517	38.9487
24.49413	74.205	1702	41.2553
24.58106	74.205	1801	42.4382
24.66799	74.205	1898	43.566
24.75492	74.205	2112	45.9565
24.84185	74.205	2626	51.2445
24.92878	74.205	3094	55.6237
25.01572	74.205	2545	50.448
25.10265	74.205	1836	42.8486
25.18958	74.205	1772	42.0951
25.27651	74.205	1618	40.2244
25.36344	74.205	1731	41.6053
25.45037	74.205	1626	40.3237
25.5373	74.205	1771	42.0833
25.62424	74.205	2317	48.1352
25.71117	74.205	3840	61.9677
25.7981	74.205	8118	90.0999
25.88503	74.205	14468	120.283
25.97196	74.205	14800	121.6553
26.05889	74.205	8078	89.8777
26.14583	74.205	3910	62.53
26.23276	74.205	2903	53.8795
26.31969	74.205	2911	53.9537
26.40662	74.205	2590	50.892
26.49355	74.205	2075	45.5522
26.58048	74.205	1625	40.3113
26.66741	74.205	1458	38.1838
26.75435	74.205	1502	38.7556
26.84128	74.205	1493	38.6394
26.92821	74.205	1562	39.5221
27.01514	74.205	1610	40.1248
27.10207	74.205	1677	40.9512
27.189	74.205	1858	43.1045
27.27593	74.205	2084	45.6508
27.36287	74.205	2008	44.8107
27.4498	74.205	1576	39.6989
27.53673	74.205	1461	38.223

27.62366	74.205	1383	37.1887
27.71059	74.205	1613	40.1622
27.79752	74.205	1786	42.2611
27.88446	74.205	1748	41.8091
27.97139	74.205	1554	39.4208
28.05832	74.205	1400	37.4166
28.14525	74.205	1396	37.3631
28.23218	74.205	1538	39.2173
28.31911	74.205	1689	41.0974
28.40604	74.205	1985	44.5533
28.49298	74.205	2079	45.5961
28.57991	74.205	1761	41.9643
28.66684	74.205	1689	41.0974
28.75377	74.205	1689	41.0974
28.8407	74.205	2249	47.4236
28.92763	74.205	3880	62.2896
29.01457	74.205	6613	81.3204
29.1015	74.205	7907	88.9213
29.18843	74.205	5837	76.4003
29.27536	74.205	3258	57.0789
29.36229	74.205	2012	44.8553
29.44922	74.205	1683	41.0244
29.53615	74.205	1672	40.8901
29.62309	74.205	1662	40.7676
29.71002	74.205	1822	42.6849
29.79695	74.205	3061	55.3263
29.88388	74.205	5908	76.8635
29.97081	74.205	8829	93.9628
30.05774	74.205	7547	86.8735
30.14468	74.205	4094	63.9844
30.23161	74.205	2101	45.8367
30.31854	74.205	1526	39.064
30.40547	74.205	1450	38.0789
30.4924	74.205	1218	34.8999
30.57933	74.205	1229	35.0571
30.66626	74.205	1218	34.8999
30.7532	74.205	1414	37.6032
30.84013	74.205	1440	37.9473
30.92706	74.205	1527	39.0768
31.01399	74.205	1494	38.6523
31.10092	74.205	1302	36.0832

31.18785	74.205	1260	35.4965
31.27478	74.205	1237	35.171
31.36172	74.205	1171	34.2199
31.44865	74.205	1163	34.1028
31.53558	74.205	1231	35.0856
31.62251	74.205	1311	36.2077
31.70944	74.205	1527	39.0768
31.79637	74.205	1840	42.8952
31.88331	74.205	1782	42.2137
31.97024	74.205	1383	37.1887
32.05717	74.205	1183	34.3948
32.1441	74.205	1169	34.1906
32.23103	74.205	1127	33.5708
32.31796	74.205	1129	33.6006
32.40489	74.205	1009	31.7648
32.49183	74.205	1028	32.0624
32.57876	74.205	980	31.305
32.66569	74.205	1089	33
32.75262	74.205	1127	33.5708
32.83955	74.205	1185	34.4238
32.92648	74.205	1311	36.2077
33.01342	74.205	1301	36.0694
33.10035	74.205	1193	34.5398
33.18728	74.205	1100	33.1662
33.27421	74.205	1084	32.9242
33.36114	74.205	1133	33.6601
33.44807	74.205	1367	36.973
33.535	74.205	1788	42.2847
33.62194	74.205	2627	51.2543
33.70887	74.205	3027	55.0182
33.7958	74.205	2343	48.4045
33.88273	74.205	1616	40.1995
33.96966	74.205	1343	36.647
34.05659	74.205	1329	36.4555
34.14352	74.205	1519	38.9744
34.23046	74.205	2082	45.6289
34.31739	74.205	3819	61.7981
34.40432	74.205	6211	78.8099
34.49125	74.205	6453	80.3306
34.57818	74.205	4347	65.9318
34.66511	74.205	2348	48.4562

34.75205	74.205	1567	39.5854
34.83898	74.205	1222	34.9571
34.92591	74.205	1099	33.1512
35.01284	74.205	1045	32.3265
35.09977	74.205	1017	31.8904
35.1867	74.205	1087	32.9697
35.27363	74.205	950	30.8221
35.36057	74.205	987	31.4166
35.4475	74.205	892	29.8664
35.53443	74.205	981	31.3209
35.62136	74.205	986	31.4006
35.70829	74.205	1085	32.9393
35.79522	74.205	1060	32.5576
35.88216	74.205	980	31.305
35.96909	74.205	941	30.6757
36.05602	74.205	899	29.9833
36.14295	74.205	886	29.7658
36.22988	74.205	858	29.2916
36.31681	74.205	903	30.05
36.40374	74.205	895	29.9166
36.49068	74.205	896	29.9333
36.57761	74.205	942	30.692
36.66454	74.205	960	30.9839
36.75147	74.205	1071	32.7261
36.8384	74.205	1391	37.2961
36.92533	74.205	1925	43.8748
37.01227	74.205	2074	45.5412
37.0992	74.205	1619	40.2368
37.18613	74.205	1213	34.8281
37.27306	74.205	1010	31.7805
37.35999	74.205	988	31.4325
37.44692	74.205	1063	32.6037
37.53385	74.205	1134	33.6749
37.62079	74.205	1489	38.5876
37.70772	74.205	2350	48.4768
37.79465	74.205	3671	60.5888
37.88158	74.205	4181	64.6607
37.96851	74.205	3245	56.9649
38.05544	74.205	1869	43.2319
38.14237	74.205	1184	34.4093
38.22931	74.205	999	31.607

38.31624	74.205	928	30.4631
38.40317	74.205	909	30.1496
38.4901	74.205	895	29.9166
38.57703	74.205	818	28.6007
38.66396	74.205	919	30.315
38.7509	74.205	825	28.7228
38.83783	74.205	796	28.2135
38.92476	74.205	860	29.3258
39.01169	74.205	798	28.2489
39.09862	74.205	781	27.9464
39.18555	74.205	801	28.3019
39.27248	74.205	878	29.6311
39.35942	74.205	987	31.4166
39.44635	74.205	937	30.6105
39.53328	74.205	987	31.4166
39.62021	74.205	935	30.5778
39.70714	74.205	919	30.315
39.79407	74.205	812	28.4956
39.88101	74.205	858	29.2916
39.96794	74.205	821	28.6531
40.05487	74.205	887	29.7825
40.1418	74.205	948	30.7896
40.22873	74.205	941	30.6757
40.31566	74.205	942	30.692
40.40259	74.205	838	28.9482
40.48953	74.205	826	28.7402
40.57646	74.205	820	28.6356
40.66339	74.205	938	30.6268
40.75032	74.205	1046	32.3419
40.83725	74.205	1009	31.7648
40.92418	74.205	872	29.5296
41.01112	74.205	790	28.1069
41.09805	74.205	762	27.6043
41.18498	74.205	892	29.8664
41.27191	74.205	990	31.4643
41.35884	74.205	1219	34.9142
41.44577	74.205	1415	37.6165
41.5327	74.205	1204	34.6987
41.61964	74.205	1092	33.0454
41.70657	74.205	975	31.225
41.7935	74.205	858	29.2916

41.88043	74.205	846	29.0861
41.96736	74.205	970	31.1448
42.05429	74.205	1192	34.5254
42.14122	74.205	1429	37.8021
42.22816	74.205	1596	39.95
42.31509	74.205	1573	39.6611
42.40202	74.205	1405	37.4833
42.48895	74.205	1103	33.2114
42.57588	74.205	923	30.3809
42.66281	74.205	898	29.9666
42.74975	74.205	900	30
42.83668	74.205	884	29.7321
42.92361	74.205	986	31.4006
43.01054	74.205	1084	32.9242
43.09747	74.205	1265	35.5668
43.1844	74.205	1186	34.4384
43.27133	74.205	1048	32.3728
43.35827	74.205	832	28.8444
43.4452	74.205	937	30.6105
43.53213	74.205	996	31.5595
43.61906	74.205	1141	33.7787
43.70599	74.205	1117	33.4215
43.79292	74.205	1020	31.9374
43.87986	74.205	882	29.6985
43.96679	74.205	783	27.9821
44.05372	74.205	729	27
44.14065	74.205	719	26.8142
44.22758	74.205	723	26.8887
44.31451	74.205	699	26.4386
44.40144	74.205	677	26.0192
44.48838	74.205	719	26.8142
44.57531	74.205	700	26.4575
44.66224	74.205	783	27.9821
44.74917	74.205	778	27.8927
44.8361	74.205	809	28.4429
44.92303	74.205	872	29.5296
45.00996	74.205	945	30.7409
45.0969	74.205	854	29.2233
45.18383	74.205	810	28.4605
45.27076	74.205	667	25.8263
45.35769	74.205	750	27.3861

45.44462	74.205	758	27.5318
45.53155	74.205	859	29.3087
45.61849	74.205	885	29.7489
45.70542	74.205	889	29.8161
45.79235	74.205	786	28.0357
45.87928	74.205	729	27
45.96621	74.205	742	27.2397
46.05314	74.205	680	26.0768
46.14007	74.205	720	26.8328
46.22701	74.205	729	27
46.31394	74.205	796	28.2135
46.40087	74.205	724	26.9072
46.4878	74.205	813	28.5132
46.57473	74.205	704	26.533
46.66166	74.205	732	27.0555
46.7486	74.205	662	25.7294
46.83553	74.205	621	24.9199
46.92246	74.205	632	25.1396
47.00939	74.205	651	25.5147
47.09632	74.205	731	27.037
47.18325	74.205	712	26.6833
47.27018	74.205	825	28.7228
47.35712	74.205	1016	31.8748
47.44405	74.205	1411	37.5633
47.53098	74.205	1733	41.6293
47.61791	74.205	1548	39.3446
47.70484	74.205	1349	36.7287
47.79177	74.205	1104	33.2265
47.87871	74.205	980	31.305
47.96564	74.205	885	29.7489
48.05257	74.205	930	30.4959
48.1395	74.205	826	28.7402
48.22643	74.205	761	27.5862
48.31336	74.205	679	26.0576
48.40029	74.205	667	25.8263
48.48723	74.205	659	25.671
48.57416	74.205	661	25.7099
48.66109	74.205	687	26.2107
48.74802	74.205	638	25.2587
48.83495	74.205	630	25.0998
48.92188	74.205	635	25.1992

49.00881	74.205	625	25
49.09575	74.205	657	25.632
49.18268	74.205	683	26.1343
49.26961	74.205	664	25.7682
49.35654	74.205	776	27.8568
49.44347	74.205	773	27.8029
49.5304	74.205	744	27.2764
49.61734	74.205	683	26.1343
49.70427	74.205	690	26.2679
49.7912	74.205	656	25.6125
49.87813	74.205	638	25.2587
49.96506	74.205	621	24.9199
50.05199	74.205	706	26.5707
50.13892	74.205	609	24.6779
50.22586	74.205	679	26.0576
50.31279	74.205	625	25
50.39972	74.205	607	24.6374
50.48665	74.205	597	24.4336
50.57358	74.205	684	26.1534
50.66051	74.205	707	26.5895
50.74745	74.205	664	25.7682
50.83438	74.205	723	26.8887
50.92131	74.205	737	27.1477
51.00824	74.205	624	24.98
51.09517	74.205	702	26.4953
51.1821	74.205	785	28.0179
51.26903	74.205	869	29.4788
51.35597	74.205	909	30.1496
51.4429	74.205	859	29.3087
51.52983	74.205	727	26.9629
51.61676	74.205	723	26.8887
51.70369	74.205	702	26.4953
51.79062	74.205	708	26.6083
51.87756	74.205	758	27.5318
51.96449	74.205	857	29.2746
52.05142	74.205	903	30.05
52.13835	74.205	897	29.95
52.22528	74.205	820	28.6356
52.31221	74.205	722	26.8701
52.39914	74.205	721	26.8514
52.48608	74.205	728	26.9815

52.57301	74.205	764	27.6405
52.65994	74.205	766	27.6767
52.74687	74.205	745	27.2947
52.8338	74.205	750	27.3861
52.92073	74.205	677	26.0192
53.00766	74.205	747	27.3313
53.0946	74.205	724	26.9072
53.18153	74.205	723	26.8887
53.26846	74.205	684	26.1534
53.35539	74.205	679	26.0576
53.44232	74.205	673	25.9422
53.52925	74.205	641	25.318
53.61619	74.205	683	26.1343
53.70312	74.205	686	26.1916
53.79005	74.205	697	26.4008
53.87698	74.205	650	25.4951
53.96391	74.205	647	25.4362
54.05084	74.205	675	25.9808
54.13777	74.205	661	25.7099
54.22471	74.205	666	25.807
54.31164	74.205	696	26.3818
54.39857	74.205	656	25.6125
54.4855	74.205	687	26.2107
54.57243	74.205	728	26.9815
54.65936	74.205	644	25.3772
54.7463	74.205	681	26.096
54.83323	74.205	665	25.7876
54.92016	74.205	715	26.7395
55.00709	74.205	705	26.5518
55.09402	74.205	704	26.533
55.18095	74.205	717	26.7769
55.26788	74.205	782	27.9643
55.35482	74.205	930	30.4959
55.44175	74.205	956	30.9192
55.52868	74.205	904	30.0666
55.61561	74.205	850	29.1548
55.70254	74.205	753	27.4408
55.78947	74.205	716	26.7582
55.8764	74.205	674	25.9615
55.96334	74.205	662	25.7294
56.05027	74.205	643	25.3574

56.1372	74.205	682	26.1151
56.22413	74.205	679	26.0576
56.31106	74.205	691	26.2869
56.39799	74.205	678	26.0384
56.48493	74.205	797	28.2312
56.57186	74.205	870	29.4958
56.65879	74.205	863	29.3769
56.74572	74.205	767	27.6948
56.83265	74.205	761	27.5862
56.91958	74.205	675	25.9808
57.00651	74.205	656	25.6125
57.09345	74.205	694	26.3439
57.18038	74.205	787	28.0535
57.26731	74.205	915	30.249
57.35424	74.205	860	29.3258
57.44117	74.205	773	27.8029
57.5281	74.205	690	26.2679
57.61504	74.205	713	26.7021
57.70197	74.205	656	25.6125
57.7889	74.205	671	25.9037
57.87583	74.205	635	25.1992
57.96276	74.205	688	26.2298
58.04969	74.205	681	26.096
58.13662	74.205	751	27.4044
58.22356	74.205	813	28.5132
58.31049	74.205	853	29.2062
58.39742	74.205	899	29.9833
58.48435	74.205	990	31.4643
58.57128	74.205	1089	33
58.65821	74.205	1122	33.4963
58.74515	74.205	921	30.348
58.83208	74.205	843	29.0345
58.91901	74.205	691	26.2869
59.00594	74.205	624	24.98
59.09287	74.205	614	24.779
59.1798	74.205	632	25.1396
59.26673	74.205	621	24.9199
59.35367	74.205	626	25.02
59.4406	74.205	618	24.8596
59.52753	74.205	671	25.9037
59.61446	74.205	664	25.7682

59.70139	74.205	688	26.2298
59.78832	74.205	646	25.4165
59.87525	74.205	714	26.7208
59.96219	74.205	767	27.6948
60.04912	74.205	786	28.0357
60.13605	74.205	806	28.3901
60.22298	74.205	747	27.3313
60.30991	74.205	692	26.3059
60.39684	74.205	718	26.7955
60.48378	74.205	851	29.1719
60.57071	74.205	861	29.3428
60.65764	74.205	799	28.2666
60.74457	74.205	762	27.6043
60.8315	74.205	727	26.9629
60.91843	74.205	687	26.2107
61.00536	74.205	609	24.6779
61.0923	74.205	636	25.219
61.17923	74.205	592	24.3311
61.26616	74.205	605	24.5967
61.35309	74.205	604	24.5764
61.44002	74.205	623	24.96
61.52695	74.205	582	24.1247
61.61389	74.205	598	24.454
61.70082	74.205	669	25.865
61.78775	74.205	632	25.1396
61.87468	74.205	661	25.7099
61.96161	74.205	656	25.6125
62.04854	74.205	630	25.0998
62.13547	74.205	640	25.2982
62.22241	74.205	613	24.7588
62.30934	74.205	627	25.04
62.39627	74.205	578	24.0416
62.4832	74.205	610	24.6982
62.57013	74.205	622	24.9399
62.65706	74.205	639	25.2784
62.744	74.205	660	25.6905
62.83093	74.205	603	24.5561
62.91786	74.205	630	25.0998
63.00479	74.205	619	24.8797
63.09172	74.205	550	23.4521
63.17865	74.205	603	24.5561

63.26558	74.205	588	24.2487
63.35252	74.205	576	24
63.43945	74.205	562	23.7065
63.52638	74.205	576	24
63.61331	74.205	587	24.2281
63.70024	74.205	573	23.9374
63.78717	74.205	610	24.6982
63.8741	74.205	595	24.3926
63.96104	74.205	584	24.1661
64.04797	74.205	566	23.7908
64.1349	74.205	587	24.2281
64.22183	74.205	536	23.1517
64.30876	74.205	565	23.7697
64.39569	74.205	571	23.8956
64.48263	74.205	570	23.8747
64.56956	74.205	565	23.7697
64.65649	74.205	595	24.3926
64.74342	74.205	566	23.7908
64.83035	74.205	558	23.622
64.91728	74.205	564	23.7487
65.00421	74.205	596	24.4131
65.09115	74.205	604	24.5764
65.17808	74.205	652	25.5343
65.26501	74.205	662	25.7294
65.35194	74.205	689	26.2488
65.43887	74.205	727	26.9629
65.5258	74.205	663	25.7488
65.61274	74.205	657	25.632
65.69967	74.205	610	24.6982
65.7866	74.205	632	25.1396
65.87353	74.205	595	24.3926
65.96046	74.205	582	24.1247
66.04739	74.205	547	23.388
66.13432	74.205	578	24.0416
66.22126	74.205	558	23.622
66.30819	74.205	557	23.6008
66.39512	74.205	568	23.8328
66.48205	74.205	574	23.9583
66.56898	74.205	578	24.0416
66.65591	74.205	562	23.7065
66.74284	74.205	591	24.3105

66.82978	74.205	569	23.8537
66.91671	74.205	604	24.5764
67.00364	74.205	520	22.8035
67.09057	74.205	533	23.0868
67.1775	74.205	537	23.1733
67.26443	74.205	528	22.9783
67.35137	74.205	590	24.2899
67.4383	74.205	543	23.3024
67.52523	74.205	570	23.8747
67.61216	74.205	563	23.7276
67.69909	74.205	599	24.4745
67.78602	74.205	627	25.04
67.87295	74.205	643	25.3574
67.95989	74.205	652	25.5343
68.04682	74.205	630	25.0998
68.13375	74.205	627	25.04
68.22068	74.205	577	24.0208
68.30761	74.205	592	24.3311
68.39454	74.205	529	23
68.48148	74.205	561	23.6854
68.56841	74.205	587	24.2281
68.65534	74.205	521	22.8254
68.74227	74.205	547	23.388
68.8292	74.205	557	23.6008
68.91613	74.205	532	23.0651
69.00306	74.205	535	23.1301
69.09	74.205	537	23.1733
69.17693	74.205	592	24.3311
69.26386	74.205	591	24.3105
69.35079	74.205	519	22.7816
69.43772	74.205	478	21.8632
69.52465	74.205	512	22.6274
69.61159	74.205	524	22.891
69.69852	74.205	543	23.3024
69.78545	74.205	519	22.7816
69.87238	74.205	484	22
69.95931	74.205	526	22.9347
70.04624	74.205	525	22.9129
70.13317	74.205	521	22.8254
70.22011	74.205	558	23.622
70.30704	74.205	542	23.2809

70.39397	74.205	527	22.9565
70.4809	74.205	534	23.1084
70.56783	74.205	564	23.7487
70.65476	74.205	534	23.1084
70.74169	74.205	564	23.7487
70.82863	74.205	613	24.7588
70.91556	74.205	611	24.7184
71.00249	74.205	620	24.8998
71.08942	74.205	559	23.6432
71.17635	74.205	569	23.8537
71.26328	74.205	574	23.9583
71.35022	74.205	526	22.9347
71.43715	74.205	509	22.561
71.52408	74.205	528	22.9783
71.61101	74.205	490	22.1359
71.69794	74.205	499	22.3383
71.78487	74.205	512	22.6274
71.8718	74.205	556	23.5797
71.95874	74.205	576	24
72.04567	74.205	588	24.2487
72.1326	74.205	568	23.8328
72.21953	74.205	546	23.3666
72.30646	74.205	523	22.8692
72.39339	74.205	555	23.5584
72.48033	74.205	560	23.6643
72.56726	74.205	500	22.3607
72.65419	74.205	512	22.6274
72.74112	74.205	512	22.6274
72.82805	74.205	472	21.7256
72.91498	74.205	496	22.2711
73.00191	74.205	558	23.622
73.08885	74.205	496	22.2711
73.17578	74.205	510	22.5832
73.26271	74.205	511	22.6053
73.34964	74.205	529	23
73.43657	74.205	493	22.2036
73.5235	74.205	544	23.3238
73.61044	74.205	481	21.9317
73.69737	74.205	545	23.3452
73.7843	74.205	484	22
73.87123	74.205	510	22.5832

73.95816	74.205	491	22.1585
74.04509	74.205	475	21.7945
74.13202	74.205	486	22.0454
74.21896	74.205	450	21.2132
74.30589	74.205	510	22.5832
74.39282	74.205	499	22.3383
74.47975	74.205	488	22.0907
74.56668	74.205	496	22.2711
74.65361	74.205	494	22.2261
74.74054	74.205	466	21.587
74.82748	74.205	464	21.5407
74.91441	74.205	498	22.3159
75.00134	74.205	516	22.7156
75.08827	74.205	528	22.9783
75.1752	74.205	482	21.9545
75.26213	74.205	499	22.3383
75.34907	74.205	467	21.6102
75.436	74.205	481	21.9317
75.52293	74.205	484	22
75.60986	74.205	467	21.6102
75.69679	74.205	497	22.2935
75.78372	74.205	435	20.8567
75.87065	74.205	459	21.4243
75.95759	74.205	481	21.9317
76.04452	74.205	487	22.0681
76.13145	74.205	512	22.6274
76.21838	74.205	502	22.4054
76.30531	74.205	446	21.1187
76.39224	74.205	423	20.567
76.47918	74.205	435	20.8567
76.56611	74.205	461	21.4709
76.65304	74.205	466	21.587
76.73997	74.205	405	20.1246
76.8269	74.205	510	22.5832
76.91383	74.205	458	21.4009
77.00076	74.205	476	21.8174
77.0877	74.205	425	20.6155
77.17463	74.205	480	21.9089
77.26156	74.205	426	20.6398
77.34849	74.205	436	20.8806
77.43542	74.205	470	21.6795

77.52235	74.205	462	21.4942
77.60928	74.205	444	21.0713
77.69622	74.205	452	21.2603
77.78315	74.205	449	21.1896
77.87008	74.205	413	20.3224
77.95701	74.205	432	20.7846
78.04394	74.205	417	20.4206
78.13087	74.205	425	20.6155
78.21781	74.205	451	21.2368
78.30474	74.205	449	21.1896
78.39167	74.205	414	20.347
78.4786	74.205	473	21.7486
78.56553	74.205	480	21.9089
78.65246	74.205	500	22.3607
78.73939	74.205	421	20.5183
78.82633	74.205	461	21.4709
78.91326	74.205	427	20.664
79.00019	74.205	452	21.2603
79.08712	74.205	436	20.8806
79.17405	74.205	450	21.2132
79.26098	74.205	428	20.6882
79.34792	74.205	381	19.5192
79.43485	74.205	368	19.1833
79.52178	74.205	438	20.9284
79.60871	74.205	376	19.3907
79.69564	74.205	449	21.1896
79.78257	74.205	421	20.5183
79.8695	74.205	398	19.9499
79.95644	74.205	397	19.9249

APPENDIX B

SAMPLE OXYGEN ADSORPTION DATA

Collected Data Sn/AlPO-5
(Sample ISn8)
p° and Temperature

p° type:	Entered
Average p°:	101.3250 kPa
Temperature type:	Entered
Temperature:	298.000 K

Free Space

	Measured before analysis
Ambient free space:	16.5426 cm³
Analysis free space:	16.5426 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
0.9694549	0.009567773	0.00824	0.00569	98
1.9895857	0.019635680	0.01681	0.01120	101
3.0567267	0.030167539	0.02578	0.01696	104
4.0747879	0.040215020	0.03432	0.02241	106
5.0260227	0.049602975	0.04230	0.02749	109
9.8596915	0.097307567	0.08260	0.05206	112
14.9334606	0.147381762	0.12478	0.07726	115
20.1621344	0.198984748	0.16819	0.10297	118
25.2473924	0.249172331	0.21037	0.12773	120
30.2565337	0.298608700	0.25187	0.15190	123
35.3224736	0.348605628	0.29379	0.17609	126
40.4182430	0.398896950	0.33592	0.20018	128
45.5252990	0.449299662	0.37809	0.22412	131
50.6151201	0.499532278	0.42007	0.24769	134
55.6060275	0.548788693	0.46119	0.27061	136
60.6939078	0.599002156	0.50307	0.29375	139
65.7670798	0.649070459	0.54476	0.31650	142
70.8634921	0.699368126	0.58659	0.33910	144

75.9516165	0.749583997	0.62833	0.36152	147
80.9791420	0.799201805	0.66955	0.38357	150
86.0807256	0.849550508	0.71133	0.40567	152
91.0093905	0.898192637	0.75169	0.42704	155
96.1439303	0.948866593	0.79366	0.44892	158
100.1691211	0.988592128	0.82658	0.46611	161
101.0389635	0.997176803	0.83423	0.47244	172
100.3785765	0.990659292	0.82899	0.47036	175
96.3939261	0.951333859	0.79664	0.45451	177
91.4017411	0.902064835	0.75604	0.43426	180
86.0516183	0.849263241	0.71247	0.41224	183
81.1145720	0.800538394	0.67219	0.39155	186
75.9313057	0.749383545	0.62983	0.36948	189
71.0476485	0.701185608	0.58983	0.34827	192
65.8356167	0.649746865	0.54708	0.32531	194
60.8747889	0.600787313	0.50633	0.30312	197
55.7473733	0.550183668	0.46418	0.28006	200
50.6427057	0.499804527	0.42210	0.25656	203
45.5910448	0.449948522	0.38042	0.23306	206
40.5149514	0.399851387	0.33849	0.20920	209
35.4896881	0.350255906	0.29690	0.18522	212
30.4047739	0.300071716	0.25479	0.16079	214
25.3539816	0.250224284	0.21289	0.13616	217
20.2716673	0.200065753	0.17067	0.11110	220
15.2114886	0.150125684	0.12857	0.08578	223
10.1327313	0.100002259	0.08621	0.05991	226

Collected Data: Sn/AlPO-5
(Sample ISn8, another run)
p° and Temperature

p° type: Entered
Average p°: 101.3250 kPa
Temperature type: Entered
Temperature: 298.000 K

Free Space

Measured before analysis
Ambient free space: 16.3937 cm³
Analysis free space: 16.3937 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
2.0395968	0.020129250	0.01486	0.00027	67
4.0501282	0.039971648	0.02954	0.00062	70
6.0926939	0.060130200	0.04442	0.00089	73
8.1109249	0.080048586	0.05911	0.00112	76
10.1347219	0.100021904	0.07383	0.00135	78
15.1614906	0.149632243	0.11044	0.00199	81
20.1772597	0.199134024	0.14700	0.00270	84
25.3087705	0.249778085	0.18437	0.00334	86
30.2930785	0.298969369	0.22069	0.00399	89
40.4189876	0.398904298	0.29437	0.00511	92
50.5907894	0.499292153	0.36840	0.00626	95
60.7696218	0.599749394	0.44254	0.00750	97
70.8267438	0.699005448	0.51589	0.00889	100
80.9564632	0.798977982	0.58980	0.01035	103
86.0486645	0.849234089	0.62703	0.01122	106
91.1219301	0.899303316	0.66411	0.01207	108
96.1956920	0.949377441	0.70119	0.01290	111
100.2830277	0.989716299	0.73115	0.01374	114

101.1134203	0.997911634	0.73732	0.01408	116
100.4201096	0.991069191	0.73233	0.01413	119
96.2450369	0.949864438	0.70199	0.01380	122
91.2058913	0.900131948	0.66537	0.01338	125
81.0319291	0.799722772	0.59139	0.01247	128
70.9086137	0.699813441	0.51771	0.01138	130
60.8966133	0.601002703	0.44471	0.01003	133
50.6864033	0.500235788	0.37025	0.00859	136
40.5076278	0.399779109	0.29603	0.00718	139
30.3888857	0.299914912	0.22226	0.00578	142
20.3230079	0.200572446	0.14888	0.00436	145
10.1301263	0.099976550	0.07450	0.00277	148

Collected Data Sn/AlPO-5
(Sample JSn(II)1)
p° and Temperature

p° type:	Entered
Average p°:	101.3250 kPa
Temperature type:	Entered
Temperature:	298.000 K

Free Space

	Measured before analysis
Ambient free space:	16.3749 cm³
Analysis free space:	16.3749 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
1.9657594	0.019400533	0.01613	0.00837	75
3.9977923	0.039455133	0.03267	0.01642	79
6.0497979	0.059706849	0.04931	0.02430	82
8.0851829	0.079794532	0.06577	0.03192	85
10.1268083	0.099943803	0.08225	0.03943	88
15.0467946	0.148500282	0.12179	0.05682	91
20.2352221	0.199706068	0.16340	0.07473	93
25.2402682	0.249102020	0.20346	0.09165	96
30.3562956	0.299593273	0.24435	0.10868	99
40.2401571	0.397139379	0.32299	0.14007	102
50.5053268	0.498448703	0.40441	0.17158	104
60.7207082	0.599266655	0.48525	0.20203	107
70.8317401	0.699054758	0.56512	0.23155	110
80.9251833	0.798669273	0.64474	0.26052	113
85.9965122	0.848719386	0.68483	0.27540	115
91.1749775	0.899826853	0.72569	0.29027	118
96.1848205	0.949270148	0.76515	0.30435	121
100.2845087	0.989730915	0.79747	0.31600	123

101.0705283	0.997488323	0.80379	0.31878	126
100.4826777	0.991686690	0.79932	0.31781	129
96.4096963	0.951489499	0.76743	0.30717	132
91.2950685	0.901012059	0.72731	0.29349	135
81.2206750	0.801585549	0.64803	0.26548	138
70.9621982	0.700342279	0.56708	0.23593	141
60.9614721	0.601642809	0.48794	0.20613	144
50.7452160	0.500816225	0.40684	0.17453	147
40.5546332	0.400243016	0.32570	0.14199	151
30.4226577	0.300248216	0.24481	0.10861	154
20.6000624	0.203306760	0.16609	0.07495	159
10.1489846	0.100162667	0.08199	0.03767	164

Collected Data: Sn/AlPO-5
(Sample JSn(II)1, another run)
p° and Temperature

p° type:	Entered
Average p°:	101.3250 kPa
Temperature type:	Entered
Temperature:	298.000 K

Free Space

	Measured before analysis
Ambient free space:	16.4874 cm³
Analysis free space:	16.4874 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
2.0321260	0.020055520	0.01501	0.00139	69
4.0493457	0.039963926	0.02997	0.00305	72
6.0674162	0.059880728	0.04486	0.00434	75
8.0925482	0.079867222	0.05982	0.00570	77
10.1272253	0.099947919	0.07484	0.00699	80
15.1997616	0.150009948	0.11229	0.01028	83
20.2275445	0.199630296	0.14945	0.01374	86
25.2770388	0.249464918	0.18671	0.01689	88
30.3428303	0.299460381	0.22411	0.02018	91
40.4806362	0.399512723	0.29885	0.02607	94
50.5622883	0.499010869	0.37312	0.03156	97
60.7177543	0.599237502	0.44798	0.03737	99
70.8173940	0.698913173	0.52252	0.04351	102
80.9662281	0.799074354	0.59743	0.04971	105
86.1096865	0.849836329	0.63539	0.05280	107
91.1625599	0.899704301	0.67269	0.05586	110
96.1859923	0.949281713	0.70980	0.05904	113
100.2197110	0.989091411	0.73961	0.06162	116

101.1103362	0.997881197	0.74625	0.06250	118
100.4000754	0.990871470	0.74105	0.06230	121
96.2726144	0.950136606	0.71062	0.06005	124
91.1863128	0.899938724	0.67317	0.05747	127
81.0302202	0.799705907	0.59839	0.05233	130
70.9363296	0.700086975	0.52392	0.04636	133
60.7912020	0.599962375	0.44904	0.04013	136
50.7255033	0.500621675	0.37467	0.03355	140
40.5103782	0.399806254	0.29921	0.02684	143
30.3918619	0.299944285	0.22446	0.02015	146
20.3588936	0.200926610	0.15039	0.01368	149
10.1297388	0.099972725	0.07479	0.00661	153

Collected Data: MnSnSi/AlPO-5
(Sample IMnSnSi1)
p° and Temperature

p° type:	Entered
Average p°:	101.3250 kPa
Temperature type:	Entered
Temperature:	298.000 K

Free Space

	Measured before analysis
Ambient free space:	16.6067 cm³
Analysis free space:	16.6067 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
2.0102453	0.019839574	0.02047	0.02708	72
3.9271725	0.038758170	0.03925	0.04945	75
6.0471415	0.059680633	0.05967	0.07253	80
8.1053168	0.079993238	0.07928	0.09394	83
10.1430871	0.100104462	0.09858	0.11460	86
15.0486093	0.148518191	0.14455	0.16200	89
20.2521376	0.199873011	0.19293	0.21044	92
25.2822712	0.249516557	0.23938	0.25577	94
30.3991245	0.300015961	0.28637	0.30067	97
40.3186622	0.397914164	0.37658	0.38353	100
50.5484304	0.498874102	0.46893	0.46568	103
60.6698945	0.598765162	0.55971	0.54420	105
70.8620925	0.699354312	0.65064	0.62088	108
80.9501242	0.798915421	0.74016	0.69454	111
86.0855185	0.849597810	0.78572	0.73195	113
91.1717876	0.899795372	0.83064	0.76802	116
96.1292424	0.948721635	0.87427	0.80247	119
100.2194425	0.989088761	0.91019	0.83052	122

101.0526668	0.997312044	0.91768	0.83704	124
100.4614311	0.991477003	0.91266	0.83381	127
96.4601967	0.951987899	0.87777	0.80751	130
91.3744159	0.901795156	0.83319	0.77304	133
81.3112030	0.802478991	0.74435	0.70181	136
70.9883679	0.700600554	0.65251	0.62535	139
60.8061626	0.600110024	0.56120	0.54650	142
50.6718415	0.500092075	0.46968	0.46496	145
40.5392780	0.400091472	0.37753	0.38041	149
30.4199968	0.300221955	0.28480	0.29257	152
20.3293224	0.200634766	0.19145	0.20083	156
10.1480214	0.100153160	0.09601	0.10237	161

Collected Data: MnSnSi/AlPO-5
(Sample IMnSnSi1, another run)
p° and Temperature

p° type:	Entered
Average p°:	101.3250 kPa
Temperature type:	Entered
Temperature:	298.000 K

Free Space

	Measured before analysis
Ambient free space:	16.6181 cm³
Analysis free space:	16.6181 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
2.0154073	0.019890519	0.01564	0.00463	69
4.0240833	0.039714605	0.03114	0.00881	72
6.0791025	0.059996063	0.04691	0.01262	75
8.1009139	0.079949786	0.06241	0.01631	78
10.1451580	0.100124901	0.07805	0.01987	81
15.2163903	0.150174061	0.11680	0.02840	84
20.1950439	0.199309540	0.15481	0.03654	87
25.2385776	0.249085336	0.19325	0.04449	90
30.3160970	0.299196544	0.23191	0.05230	93
40.4124330	0.398839609	0.30854	0.06646	95
50.5599447	0.498987740	0.38549	0.08026	98
60.7193126	0.599252882	0.46246	0.09372	101
70.8737452	0.699469315	0.53940	0.10713	104
80.9426297	0.798841456	0.61569	0.12036	106
86.0442703	0.849190722	0.65439	0.12732	109
91.1341198	0.899423619	0.69296	0.13400	112
96.1709870	0.949133622	0.73108	0.14033	115
100.2185880	0.989080329	0.76175	0.14566	117

101.0216635	0.997006065	0.76783	0.14668	120
100.4410389	0.991275747	0.76348	0.14618	123
96.3311627	0.950714433	0.73247	0.14146	126
91.1795507	0.899871987	0.69356	0.13539	129
81.0573339	0.799973498	0.61707	0.12318	132
71.0496015	0.701204882	0.54134	0.11053	135
60.7926546	0.599976710	0.46360	0.09685	138
50.6384824	0.499762846	0.38654	0.08274	141
40.5589908	0.400286022	0.31000	0.06847	144
30.4049285	0.300073242	0.23284	0.05374	147
20.4460406	0.201786684	0.15707	0.03878	150
10.1447929	0.100121297	0.07842	0.02180	154

Collected Data: MnSnSi/AlPO-5
(Sample IMnSnSi2)
p° and Temperature

p° type:	Entered
Average p°:	101.3250 kPa
Temperature type:	Entered
Temperature:	298.000 K

Free Space

	Measured before analysis
Ambient free space:	16.3919 cm³
Analysis free space:	16.3919 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
1.9943690	0.019682887	0.02159	0.03617	74
4.0369396	0.039841486	0.04146	0.06191	78
5.9987355	0.059202902	0.06005	0.08416	81
8.0816172	0.079759342	0.07949	0.10631	84
10.0867054	0.099548019	0.09802	0.12672	87
14.9369566	0.147416265	0.14215	0.17251	90
20.2318776	0.199673060	0.18972	0.21946	93
25.2536989	0.249234571	0.23444	0.26200	95
30.3632937	0.299662339	0.27965	0.30379	98
40.1313688	0.396065722	0.36512	0.37887	101
50.5273424	0.498665980	0.45524	0.45446	104
60.7098000	0.599159000	0.54287	0.52522	106
70.8360936	0.699097724	0.62945	0.59270	109
81.0217655	0.799622465	0.71607	0.65822	112
86.0124288	0.848876471	0.75855	0.69049	114
91.1237935	0.899321707	0.80183	0.72238	117
96.2068565	0.949487626	0.84477	0.75355	120
100.2558897	0.989448467	0.87892	0.77815	122

101.0075696	0.996866969	0.88545	0.78364	125
100.4655974	0.991518121	0.88110	0.78147	128
96.4983284	0.952364229	0.84799	0.75914	131
91.3819836	0.901869844	0.80506	0.72923	134
81.4537939	0.803886253	0.72126	0.66862	137
71.1243350	0.701942444	0.63348	0.60251	140
60.9512068	0.601541499	0.54640	0.53418	143
50.8141150	0.501496205	0.45894	0.46261	146
40.6376342	0.401062172	0.37039	0.38697	150
30.4638734	0.300654984	0.28102	0.30702	153
20.2405256	0.199758409	0.19000	0.22057	158
10.1568687	0.100240477	0.09853	0.12671	163

Collected Data: MnSnSi/AlPO-5
(Sample IMnSnSi2 , another run)
p° and Temperature

p° type:	Entered
Average p°:	101.3250 kPa
Temperature type:	Entered
Temperature:	298.000 K

Free Space

	Measured before analysis
Ambient free space:	16.4248 cm³
Analysis free space:	16.4248 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
1.9898409	0.019638198	0.01542	0.00487	71
4.0326639	0.039799289	0.03094	0.00839	75
6.0603042	0.059810538	0.04631	0.01168	78
8.1088117	0.080027731	0.06181	0.01490	81
10.1076296	0.099754524	0.07689	0.01787	84
15.1753150	0.149768679	0.11502	0.02482	86
20.2161400	0.199517742	0.15291	0.03154	89
25.2158032	0.248860570	0.19046	0.03806	92
30.2835944	0.298875769	0.22847	0.04441	95
40.4286100	0.398999264	0.30433	0.05600	97
50.5198845	0.498592377	0.37970	0.06709	100
60.7027205	0.599089131	0.45568	0.07785	103
70.7873265	0.698616429	0.53087	0.08820	105
80.9955307	0.799363548	0.60699	0.09869	108
86.0603334	0.849349253	0.64481	0.10411	111
91.0700300	0.898791102	0.68217	0.10925	114
96.2081910	0.949500797	0.72047	0.11441	116
100.3032165	0.989915547	0.75099	0.11852	119

101.0638719	0.997422630	0.75668	0.11938	122
100.4148122	0.991016910	0.75191	0.11905	125
96.4009324	0.951403005	0.72209	0.11549	128
91.2560662	0.900627136	0.68381	0.11063	131
81.0706303	0.800104723	0.60807	0.10121	134
71.0254987	0.700967006	0.53334	0.09170	137
60.8458037	0.600501251	0.45749	0.08151	140
50.7229034	0.500596016	0.38195	0.07074	143
40.5730725	0.400424997	0.30615	0.05964	146
30.4212968	0.300234785	0.23024	0.04804	149
20.2660932	0.200010741	0.15419	0.03588	152
10.1563693	0.100235548	0.07824	0.02254	158

Collected Data: MnSnSi/AlPO-5
(Sample IMnSnSi3)
p° and Temperature

p° type:	Entered
Average p°:	101.3250 kPa
Temperature type:	Entered
Temperature:	298.000 K

Free Space

	Measured before analysis
Ambient free space:	16.6390 cm³
Analysis free space:	16.6390 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
1.0236416	0.010102555	0.00747	-0.00022	66
2.0072597	0.019810108	0.01541	0.00452	69
3.0522534	0.030123392	0.02341	0.00671	72
4.0481096	0.039951726	0.03104	0.00884	75
5.0634662	0.049972514	0.03879	0.01082	77
6.0832053	0.060036554	0.04657	0.01279	80
7.0969756	0.070041687	0.05429	0.01468	83
8.1145694	0.080084555	0.06202	0.01647	86
9.1204913	0.090012229	0.06969	0.01836	88
10.1345184	0.100019897	0.07740	0.02014	91
15.0929009	0.148955315	0.11506	0.02868	94
20.1871486	0.199231620	0.15376	0.03745	97
25.2488388	0.249186606	0.19217	0.04590	99
30.3193011	0.299228166	0.23063	0.05420	102
40.4705337	0.399413018	0.30746	0.06972	105
50.6447400	0.499824604	0.38443	0.08507	108
60.7326294	0.599384308	0.46079	0.10043	110
70.8798238	0.699529307	0.53764	0.11609	113

80.9994936	0.799402659	0.61433	0.13196	116
86.0825484	0.849568498	0.65297	0.14072	119
91.1476360	0.899557013	0.69144	0.14918	121
96.1827455	0.949249669	0.72969	0.15761	124
100.2174488	0.989069085	0.76033	0.16428	127
101.0622526	0.997406648	0.76691	0.16673	129
100.3841588	0.990714384	0.76195	0.16680	132
96.3191357	0.950595735	0.73140	0.16215	135
91.1937910	0.900012528	0.69279	0.15562	138
81.0391306	0.799793846	0.61629	0.14268	141
71.0289245	0.701000816	0.54072	0.12886	144
60.8735358	0.600774946	0.46389	0.11366	146
50.6445203	0.499822436	0.38644	0.09793	149
40.5603579	0.400299514	0.31004	0.08204	152
30.3910807	0.299936576	0.23294	0.06564	155
20.4299713	0.201628093	0.15731	0.04881	158
10.1369210	0.100043608	0.07889	0.02963	161

Collected Data: Mo/AlPO-5
(Sample IMo1)
p° and Temperature

p° type:	Entered
Average p°:	101.3250 kPa
Temperature type:	Entered
Temperature:	298.000 K

Free Space

	Measured before analysis
Ambient free space:	16.7313 cm³
Analysis free space:	16.7313 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
0.9654633	0.009528380	0.00863	0.00522	98
1.9437881	0.019183692	0.01814	0.01317	102
3.0390582	0.029993165	0.02828	0.02032	105
4.0263696	0.039737169	0.03746	0.02690	108
5.0138461	0.049482802	0.04659	0.03327	111
9.8048315	0.096766141	0.09055	0.06315	113
14.8733897	0.146788908	0.13699	0.09450	116
20.1793124	0.199154282	0.18550	0.12697	119
25.2242762	0.248944192	0.23152	0.15746	121
30.3064156	0.299100996	0.27776	0.18776	124
35.3763754	0.349137597	0.32377	0.21755	127
40.4804613	0.399510996	0.36997	0.24716	130
45.4865693	0.448917429	0.41512	0.27559	132
50.5689813	0.499076924	0.46083	0.30403	135
55.6573783	0.549295486	0.50648	0.33208	138
60.7241625	0.599300746	0.55177	0.35944	140
65.8129826	0.649523484	0.59710	0.38637	143
70.8523928	0.699258583	0.64184	0.41254	146

75.9445289	0.749514048	0.68694	0.43856	148
81.0403431	0.799805812	0.73194	0.46416	151
86.1383137	0.850118858	0.77679	0.48916	154
91.0832288	0.898921364	0.82017	0.51300	156
96.1979705	0.949399928	0.86489	0.53710	159
100.2241377	0.989135100	0.89999	0.55574	162
100.9795852	0.996590785	0.90700	0.56070	173
100.4328039	0.991194474	0.90234	0.55854	176
96.4465422	0.951853140	0.86776	0.54069	178
91.3893642	0.901942685	0.82369	0.51736	181
86.1012887	0.849753450	0.77745	0.49239	184
81.0580906	0.799980967	0.73315	0.46787	187
75.9726027	0.749791115	0.68829	0.44249	190
70.9191272	0.699917201	0.64350	0.41655	193
65.8573963	0.649961813	0.59849	0.39003	195
60.8297202	0.600342520	0.55361	0.36311	198
55.7308057	0.550020158	0.50795	0.33527	201
50.7183220	0.500550802	0.46286	0.30724	204
45.5846162	0.449885077	0.41654	0.27801	207
40.5156634	0.399858414	0.37067	0.24865	210
35.4765625	0.350126367	0.32494	0.21906	213
30.3949826	0.299975084	0.27868	0.18866	215
25.3383538	0.250070050	0.23252	0.15801	218
20.2635909	0.199986046	0.18609	0.12684	221
15.1987241	0.149999709	0.13960	0.09525	224
10.4753525	0.103383667	0.09617	0.06548	227

Collected Data: Mo/AlPO-5
(Sample IMo1, another run)
p° and Temperature

p° type:	Entered
Average p°:	101.3250 kPa
Temperature type:	Entered
Temperature:	298.000 K

Free Space

	Measured before analysis
Ambient free space:	16.5701 cm³
Analysis free space:	16.5701 cm³

Isotherm Data Table

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Dosed (mmol)	Quantity Adsorbed (mmol/g)	Run Time (min)
2.0254688	0.019989818	0.01502	0.00109	71
4.0531837	0.040001804	0.03012	0.00245	74
6.0706890	0.059913028	0.04514	0.00374	77
8.0915183	0.079857058	0.06018	0.00508	79
10.1233092	0.099909270	0.07531	0.00644	82
15.1156295	0.149179629	0.11250	0.00978	85
20.1792656	0.199153820	0.15024	0.01329	88
25.3036480	0.249727530	0.18847	0.01698	90
30.3508944	0.299539968	0.22612	0.02060	93
40.4086166	0.398801944	0.30109	0.02751	96
50.5641965	0.499029702	0.37676	0.03433	98
60.7110084	0.599170926	0.45239	0.04118	101
70.8639966	0.699373105	0.52806	0.04801	104
80.9887848	0.799296971	0.60357	0.05495	107
86.0564438	0.849310865	0.64141	0.05866	109
91.1405076	0.899486662	0.67936	0.06225	112
96.1368346	0.948796563	0.71665	0.06580	115
100.1873732	0.988772262	0.74691	0.06877	117

101.0364328	0.997151827	0.75331	0.06963	120
100.3915394	0.990787225	0.74858	0.06957	123
96.2791976	0.950201577	0.71801	0.06720	126
91.1917079	0.899991969	0.68016	0.06416	129
81.1431016	0.800819959	0.60536	0.05793	132
71.0809547	0.701514314	0.53043	0.05149	135
60.8960559	0.600997202	0.45452	0.04464	138
50.6432102	0.499809506	0.37803	0.03741	141
40.4715875	0.399423419	0.30211	0.03001	144
30.3820157	0.299847111	0.22676	0.02245	147
20.2346138	0.199700064	0.15097	0.01474	150
10.1243325	0.099919369	0.07539	0.00675	156

3Flex Share 5.00	3Flex Share Version 5.00	Page 1	
	Serial # 994 Unit 1 Port 1		

Sample:	IAL2 PORT 1 O2		
Operator:	Allan		
Submitter:			
File:	C:\3Flex Share\data\Allan\IAL2 PORT 1 O2.SMP		
Started:	12/22/2020 4:24:43 PM	Analysis adsorptive:	O2
Completed:	12/22/2020 7:04:56 PM	Analysis bath temp.:	298.000 K
Report time:	12/22/2020 7:04:56 PM	Thermal correction:	No
Sample mass:	0.1950 g	Ambient free space:	16.5985 cm³ Measured
Analysis free space:	16.5985 cm³	Equilibration interval:	10 s
Low pressure dose:	None	Sample density:	1.000 g/cm³
Automatic degas:	No		

Isotherm Tabular Report

Relative Pressure (P/Po)	Absolute Pressure (kPa)	Quantity Adsorbed (mmol/g)	Elapsed Time (h:min)	Saturation Pressure (kPa)
				101.325
0.022975	2.32791	0.000926	01:10	
0.039882	4.041092	0.001801	01:12	
0.060116	6.091302	0.002797	01:15	

0.07976	8.081694	0.003763	01:18
0.09973	10.10516	0.004724	01:21
0.149524	15.15052	0.007071	01:23
0.199433	20.20751	0.009462	01:26
0.249228	25.25304	0.011808	01:29
0.299416	30.33835	0.014152	01:31
0.399221	40.45107	0.018443	01:34
0.499287	50.59026	0.022539	01:37
0.600107	60.80587	0.026359	01:40
0.699343	70.8609	0.030185	01:42
0.799913	81.05117	0.034366	01:45
0.849003	86.02525	0.036388	01:48
0.899204	91.11185	0.038515	01:51
0.950571	96.31667	0.040613	01:53
0.989468	100.2579	0.042505	01:56
0.997228	101.0441	0.042816	01:59
0.991001	100.4132	0.042801	02:01
0.949984	96.25715	0.041364	02:04
0.900236	91.21641	0.039553	02:07
0.799734	81.03304	0.035858	02:11
0.700219	70.9497	0.032174	02:14
0.600347	60.83014	0.028232	02:17
0.500459	50.70898	0.023972	02:20
0.40036	40.5665	0.019496	02:23
0.30022	30.41982	0.014938	02:26
0.199868	20.25159	0.010255	02:29
0.100275	10.16037	0.005545	02:33

APPENDIX C

SAMPLE TEXTURE ANALYSIS DATA

3Flex 5.02	3Flex Version 5.02	Page 1		3Flex 5.02	3Flex Version 5.02	Page 1	
	Serial # 994 Unit 1 Port 3				Serial # 994 Unit 1 Port 3		
Sample:	ISn3 surface area run **1 (Sn/AlPO-5)**			Sample:	ISn3 surface area run 1		
Operator:	Allan			Operator:	Allan		
Submitter:	Allan			Submitter:	Allan		
File:	C:\3Flex\data\Allan\ISn3 surface area run 1.SMP			File:	C:\3Flex\data\Allan\ISn3 surface area run 1.SMP		
Started:	1/12/2021 7:16:24 PM	Analysis adsorptive:	N2	Started:	1/12/2021 7:16:24 PM	Analysis adsorptive:	N2
Completed:	1/13/2021 11:54:14 AM	Analysis bath temp.:	77.300 K	Completed:	1/13/2021 11:54:14 AM	Analysis bath temp.:	77.300 K
Report time:	1/13/2021 1:30:29 PM	Thermal correction:	No	Report time:	1/13/2021 1:30:29 PM	Thermal correction:	No
Sample mass:	0.1900 g	Ambient free space:	16.8961 cm³ Measured	Sample mass:	0.1900 g	Ambient free space:	16.8961 cm³ Measured
Analysis free space:	58.5038 cm³	Equilibration interval:	10 to 45 s	Analysis free space:	58.5038 cm³	Equilibration interval:	10 to 45 s

Low pressure dose: 0.13384 mmol/g Sample density: 1.000 g/cm³

Automatic degas: No

Comments: helium backfill

Summary Report

Surface Area

Single point surface area at p/p° = 0.250716465:	259.4985 m²/g
BET Surface Area:	257.3506 m²/g
t-Plot Micropore Area:	132.2775 m²/g
t-Plot external surface area:	125.0731 m²/g

Low pressure dose: 0.13384 mmol/g Sample density: 1.000 g/cm³

Automatic degas: No

Comments: helium backfill

Isotherm Tabular Report

Relative Pressure (p/p°)	Absolute Pressure (kPa)	Quantity Adsorbed (mmol/g)	Elapsed Time (h:min)
			01:36
0.001915	0.190224	2.379637	04:42
0.00339	0.336595	2.472246	04:52
0.003999	0.397173	2.501337	04:59
0.004969	0.49333	2.538162	05:05
0.005927	0.588319	2.568551	05:09
0.006948	0.689557	2.597002	05:13
0.007972	0.791078	2.622091	05:18
0.008975	0.890532	2.64384	05:22
0.009944	0.986822	2.663426	05:26
0.019187	1.903522	2.791425	05:30

BJH Adsorption						
cumulative surface area						
of pores		|	0.029886	2.965293	2.885401	05:35
between 17.000 Å and						
3,000.000 Å width:	110.4153 m²/g	|	0.038945	3.864532	2.945095	05:39
		|	0.04774	4.736797	2.993065	05:42
BJH Desorption						
cumulative surface area						
of pores		|	0.057825	5.736858	3.040297	05:46
between 17.000 Å and						
3,000.000 Å width:	116.7162 m²/g	|	0.069641	6.909208	3.088566	05:49
		|	0.080023	7.938433	3.126395	05:52
		|	0.090057	8.932436	3.160088	05:56
		|	0.100049	9.923225	3.191414	05:59
Pore Volume		|	0.145264	14.40693	3.314326	06:02
		|	0.200302	19.86649	3.44224	06:06
t-Plot micropore						
volume:	0.064806 cm³/g	|	0.250716	24.86265	3.549938	06:09
		|	0.300676	29.82168	3.652938	06:12
BJH Adsorption						
cumulative volume of						
pores		|	0.350291	34.73183	3.754714	06:16
between 17.000 Å and						
3,000.000 Å width:	0.342285 cm³/g	|	0.399222	39.58429	3.858114	06:19
		|	0.448894	44.50946	3.968964	06:22
BJH Desorption						
cumulative volume of						
pores		|	0.499581	49.5321	4.092927	06:26
between 17.000 Å and						
3,000.000 Å width:	0.309969 cm³/g	|	0.548775	54.41623	4.228888	06:29
		|	0.598478	59.33335	4.387255	06:33

					|	0.647502	64.18721	4.576175	06:37
					|	0.696687	69.06127	4.813933	06:42
Pore Size					|	0.744287	73.78575	5.11925	06:47
					|	0.797542	79.05409	5.60911	06:55
BJH Adsorption average pore width (4V/A):	123.999 Å				|	0.845157	83.76033	6.324995	07:03
					|	0.898819	89.10018	7.839801	07:20
BJH Desorption average pore width (4V/A):	106.230 Å				|	0.948183	93.94698	10.14131	07:36
					|	0.990993	98.19676	11.98267	07:52
					|	0.995066	98.59388	12.2611	08:03
					|	0.948566	93.97164	10.95325	08:14
DFT Pore Size					|	0.905234	89.65709	9.492425	08:28
					|	0.853505	84.55704	7.595119	08:45
Volume in Pores	<	10.22 Å	:	0.10700 cm³/g	|	0.801117	79.37062	6.175141	08:57
Total Volume in Pores	<=	448.83 Å	:	0.40630 cm³/g	|	0.748916	74.19425	5.445643	09:05
Total Area in Pores	>=	10.22 Å	:	112.180 m²/g	|	0.69432	68.7862	4.996848	09:11
					|	0.656164	64.9985	4.774772	09:16
					|	0.60148	59.58927	4.532515	09:21
Horvath-Kawazoe					|	0.551217	54.60759	4.355191	09:26
					|	0.501484	49.67882	4.194514	09:31

Maximum pore volume					
at p/p° = 0.145264049: 0.115146 cm^3/g	|	0.454537	45.02908	3.965226	09:37
	|	0.402641	39.88523	3.821232	09:41
	|	0.353428	35.00908	3.717836	09:44
	|	0.301174	29.84037	3.616633	09:47
	|	0.250629	24.82955	3.518355	09:51
	|	0.200324	19.84585	3.417763	09:54
	|	0.150149	14.87512	3.309232	09:58
	|	0.100542	9.961141	3.183483	10:02

3Flex 5.02	3Flex Version 5.02	Page 1		3Flex 5.02	3Flex Version 5.02	Page 1	
	Serial # 994 Unit 1 Port 2				Serial # 994 Unit 1 Port 2		
Sample:	IMnSnSi1 BET Surface Area **(MnSnSi/AlPO-5)**			Sample:	IMnSnSi1 BET Surface Area		
Operator:	Allan			Operator:	Allan		
Submitter:	Allan			Submitter:	Allan		
File:	C:\3Flex\data\Allan\IMnSnSi1-2-BET.SMP			File:	C:\3Flex\data\Allan\IMnSnSi1-2-BET.SMP		
Started:	6/3/2021 2:07:41 PM	Analysis adsorptive:	N2	Started:	6/3/2021 2:07:41 PM	Analysis adsorptive:	N2
Completed:	6/3/2021 9:36:33 PM	Analysis bath temp.:	77.300 K	Completed:	6/3/2021 9:36:33 PM	Analysis bath temp.:	77.300 K
Report time:	6/4/2021 1:00:25 PM	Thermal correction:	No	Report time:	6/4/2021 1:00:25 PM	Thermal correction:	No
Sample mass:	0.1600 g	Ambient free space:	16.8997 cm³ Measured	Sample mass:	0.1600 g	Ambient free space:	16.8997 cm³ Measured
Analysis free space:	58.3296 cm³	Equilibration interval:	10 s	Analysis free space:	58.3296 cm³	Equilibration interval:	10 s

Low pressure dose:	None	Sample density:	1.000 g/cm³
Automatic degas:	No		

Summary Report

Surface Area

Single point surface area at p/p° = 0.299772488:	325.5083 m²/g
BET Surface Area:	307.4648 m²/g
t-Plot Micropore Area:	266.8536 m²/g
t-Plot external surface area:	40.6112 m²/g

Low pressure dose:	None	Sample density:	1.000 g/cm³
Automatic degas:	No		

Isotherm Tabular Report

Relative Pressure (p/p°)	Absolute Pressure (kPa)	Quantity Adsorbed (mmol/g)	Elapsed Time (h:min)
			02:42
0.009701	0.942863	4.384922	04:37
0.023205	2.255673	4.469856	04:44
0.029164	2.834944	4.493095	04:50
0.039902	3.878338	4.524538	04:54
0.049164	4.77957	4.546284	04:58
0.097663	9.493548	4.618151	05:02
0.150952	14.67494	4.670674	05:05
0.200452	19.48619	4.70815	05:08
0.250038	24.30209	4.738313	05:11
0.299772	29.1421	4.764914	05:15

BJH Adsorption cumulative surface area of pores		0.34956	33.97549	4.788379	05:18
between 17.000 Å and 3,000.000 Å width:	22.6270 m^2/g	0.39941	38.81927	4.808349	05:21
		0.449589	43.69773	4.826223	05:24
BJH Desorption cumulative surface area of pores		0.49973	48.56921	4.842337	05:27
between 17.000 Å and 3,000.000 Å width:	22.8125 m^2/g	0.549217	53.38307	4.85639	05:30
		0.599495	58.27077	4.868585	05:33
		0.649613	63.14657	4.879482	05:35
		0.69979	68.0254	4.890323	05:38
Pore Volume		0.749239	72.82877	4.9026	05:41
		0.79946	77.7138	4.918944	05:44
t-Plot micropore volume:	0.145702 cm^3/g	0.849574	82.58274	4.944558	05:47
		0.899329	87.42834	4.988827	05:50
BJH Adsorption cumulative volume of pores		0.947429	92.09565	5.087625	05:53
between 17.000 Å and 3,000.000 Å width:	0.030929 cm^3/g	0.985822	95.82477	5.276634	05:57
		0.994667	96.69669	5.336628	06:00
BJH Desorption cumulative volume of pores		0.954536	92.80332	5.200291	06:03
between 17.000 Å and 3,000.000 Å width:	0.030263 cm^3/g	0.905341	88.00542	5.051955	06:07
		0.848838	82.5274	4.979765	06:10

		0.801196	77.88635	4.950431	06:13
		0.750857	72.99183	4.93051	06:15
Pore Size		0.700364	68.09605	4.916584	06:18
		0.649968	63.1964	4.906286	06:21
BJH Adsorption average pore width (4V/A):	54.676 Å	0.600323	58.36951	4.898034	06:24
		0.550212	53.49829	4.890623	06:28
BJH Desorption average pore width (4V/A):	53.065 Å	0.500166	48.63549	4.88385	06:32
		0.450366	43.79212	4.866412	06:35
		0.400405	38.93461	4.838812	06:38
		0.350222	34.05901	4.805211	06:41
		0.299771	29.15259	4.780269	06:44
		0.250272	24.33486	4.75591	06:47
		0.200653	19.51044	4.728403	06:50
		0.150161	14.60398	4.692809	06:54
		0.100113	9.736931	4.646502	06:58

3Flex Share 5.00	3Flex Share Version 5.00	Page 1		3Flex Share 5.00	3Flex Share Version 5.00	Page 1	
	Serial # 994 Unit 1 Port 2				Serial # 994 Unit 1 Port 2		
Sample:	Zeolite Powder I Samples **(Basic $AlPO_4$-5)**			Sample:	Zeolite Powder I Samples		
Operator:	Allan			Operator:	Allan		
Submitter:	Allan			Submitter:	Allan		
File:	C:\3Flex Share\data\Allan\IAl5 tube D PORT 2.SMP			File:	C:\3Flex Share\data\Allan\IAl5 tube D PORT 2.SMP		
Started:	12/19/2020 8:12:38 PM	Analysis adsorptive:	N2	Started:	12/19/2020 8:12:38 PM	Analysis adsorptive:	N2
Completed:	12/20/2020 7:24:07 AM	Analysis bath temp.:	77.300 K	Completed:	12/20/2020 7:24:07 AM	Analysis bath temp.:	77.300 K
Report time:	12/20/2020 7:24:07 AM	Thermal correction:	No	Report time:	12/20/2020 7:24:07 AM	Thermal correction:	No
Sample mass:	0.1870 g	Ambient free space:	16.8809 cm³ Measured	Sample mass:	0.1870 g	Ambient free space:	16.8809 cm³ Measured
Analysis free space:	57.0873 cm³	Equilibration interval:	10 to 45 s	Analysis free space:	57.0873 cm³	Equilibration interval:	10 to 45 s

Low pressure dose:	0.13384 mmol/g	Sample density:	1.000 g/cm³
Automatic degas:	No		

Summary Report

Surface Area

Single point surface area at P/Po = 0.250381569:	280.3357 m²/g
BET Surface Area:	273.4731 m²/g
t-Plot Micropore Area:	262.7610 m²/g
t-Plot external surface area:	10.7121 m²/g

Low pressure dose:	0.13384 mmol/g	Sample density:	1.000 g/cm³
Automatic degas:	No		

Isotherm Tabular Report

Relative Pressure (P/Po)	Absolute Pressure (kPa)	Quantity Adsorbed (mmol/g)	Elapsed Time (h:min)	Saturation Pressure (kPa)
			01:53	99.04155
7.85E-06	0.000778	0.126553	02:27	99.08031
1.03E-05	0.001018	0.25481	02:40	99.09304
1.25E-05	0.001238	0.383035	02:51	99.08772
1.46E-05	0.001445	0.510224	03:02	99.09602
1.65E-05	0.001639	0.638404	03:13	99.07873
1.84E-05	0.001827	0.766007	03:24	99.07926
2.04E-05	0.002017	0.893813	03:35	99.06544
2.24E-05	0.00222	1.021582	03:44	99.08314
2.42E-05	0.002394	1.15013	03:52	99.03647

		|	2.58E-05	0.00256	1.278436	04:03	99.04519
		|	2.79E-05	0.002761	1.407247	04:13	99.04864
BJH Adsorption cumulative surface area of pores between 17.000 Å and 3,000.000 Å diameter:	2.4759 m^2/g	|	3.02E-05	0.002986	1.536417	04:22	99.02984
		|	3.27E-05	0.003234	1.664136	04:31	99.03021
		|	3.57E-05	0.003533	1.793377	04:40	99.03674
BJH Desorption cumulative surface area of pores between 17.000 Å and 3,000.000 Å diameter:	4.6291 m^2/g	|	3.9E-05	0.003864	1.921974	04:50	98.99628
		|	4.32E-05	0.004276	2.049974	05:00	98.99594
		|	4.83E-05	0.004781	2.178391	05:09	98.98658
		|	5.46E-05	0.005409	2.307439	05:18	98.98248
Pore Volume		|	5.96E-05	0.005901	2.435791	05:31	98.99269
		|	6.7E-05	0.006632	2.564668	05:46	98.9457
t-Plot micropore volume:	0.128342 cm^3/g	|	7.97E-05	0.007885	2.692709	06:01	98.92826
		|	9.75E-05	0.009647	2.820543	06:16	98.95698
		|	0.000121	0.011973	2.948335	06:36	98.96483
BJH Adsorption cumulative volume of pores between 17.000 Å and 3,000.000 Å diameter:	0.007453 cm^3/g	|	0.000161	0.015942	3.075973	06:52	98.97571
		|	0.000228	0.022536	3.202703	07:07	98.95403

BJH Desorption cumulative volume of pores between 17.000 Å and 3,000.000 Å diameter:	0.008537 cm^3/g				0.000369	0.036536	3.3275	07:27	98.93387
					0.000813	0.080384	3.445879	07:45	98.9186
					0.002389	0.236375	3.536772	08:05	98.93082
					0.003147	0.311403	3.556413	08:12	98.93774
					0.00429	0.424416	3.578333	08:19	98.92
Pore Size					0.00543	0.53723	3.59514	08:25	98.94279
					0.005946	0.588176	3.601761	08:29	98.92347
BJH Adsorption average pore diameter (4V/A):	120.416 Å				0.007046	0.697026	3.613369	08:34	98.92537
					0.007975	0.788869	3.622032	08:38	98.91341
BJH Desorption average pore diameter (4V/A):	73.765 Å				0.008998	0.890103	3.630714	08:42	98.92057
					0.010938	1.081859	3.644497	08:46	98.90422
					0.020275	2.005525	3.699531	08:51	98.91823
					0.030557	3.02297	3.731084	08:54	98.93023
DFT Pore Size					0.039278	3.885117	3.749933	08:57	98.91316
					0.056451	5.584331	3.775211	09:00	98.92383
Volume in Pores	<	5.22 Å	:	0.03450 cm^3/g	0.06032	5.966668	3.779859	09:03	98.9166
Total Volume in Pores	<=	448.83 Å	:	0.13238 cm^3/g	0.070287	6.953622	3.789603	09:06	98.93209

Total Area in Pores	>=	5.22 Å	:	531.662 m^2/g	0.080516	7.964832	3.797723	09:09	98.92214
					0.090187	8.923285	3.803917	09:11	98.94159
					0.100547	9.947251	3.809277	09:14	98.93101
Horvath-Kawazoe					0.149165	14.75591	3.825372	09:17	98.92341
					0.200046	19.79262	3.832176	09:20	98.94
Maximum pore volume at P/Po = 0.149165029:	0.132901 cm^3/g				0.250382	24.77065	3.833277	09:23	98.93158
					0.300036	29.68284	3.830256	09:25	98.93077
Median pore width:	6.724 Å				0.349915	34.61823	3.82503	09:28	98.93317
					0.414995	41.0607	3.815047	09:31	98.94276
					0.464992	46.00682	3.806353	09:34	98.9411
					0.51441	50.8992	3.797799	09:36	98.94682
					0.564569	55.86652	3.789526	09:39	98.95419
					0.614603	60.81852	3.782471	09:42	98.9558
					0.664573	65.76888	3.77791	09:44	98.96418
					0.714145	70.67235	3.774937	09:47	98.96076
					0.763939	75.59684	3.77742	09:50	98.95669
					0.799453	79.11225	3.784988	09:52	98.958
					0.849168	84.03076	3.80921	09:55	98.95656
					0.899534	89.02261	3.858218	09:58	98.96524
					0.950396	94.04842	3.905311	10:01	98.9571
					0.988115	97.79017	3.970777	10:04	98.96635
					0.994716	98.43619	4.009313	10:07	98.95914
					0.938133	92.85489	3.921075	10:10	98.97839
					0.885561	87.65403	3.915992	10:13	98.98138
					0.835709	82.71345	3.911691	10:16	98.97393
					0.800483	79.23154	3.896685	10:19	98.97972
					0.749702	74.21058	3.881874	10:21	98.98683

0.700441	69.3335	3.873631	10:24	98.98552
0.650381	64.38473	3.861192	10:27	98.99539
0.600279	59.42538	3.847951	10:30	98.99628
0.549741	54.42164	3.841718	10:33	98.99503
0.485217	48.03207	3.836569	10:36	98.99097
0.451574	44.70141	3.800117	10:39	98.99022
0.384923	38.11272	3.798474	10:42	99.01385
0.335076	33.16858	3.804102	10:45	98.98813
0.28464	28.17803	3.810582	10:47	98.99548
0.234711	23.23333	3.814699	10:50	98.98708
0.186664	18.47778	3.815708	10:53	98.98936
0.14854	14.70412	3.812698	10:56	98.99082
0.100146	9.914505	3.800684	10:59	99.0002

APPENDIX D

XPS DATA

Fresh Sn/AlPO-5		
BE_wide	CPS_wide	Background_wide
1299.97	180047	180047
1298.97	179858	179858
1297.97	179647	179647
1296.97	178334	178334
1295.97	178419	178419
1294.97	179202	179202
1293.97	178074	178074
1292.97	177901	177901
1291.97	178130	178130
1290.97	177828	177828
1289.97	177498	177498
1288.97	177470	177470
1287.97	177952	177952
1286.97	176287	176287
1285.97	175785	175785
1284.97	177450	177450
1283.97	176884	176884
1282.97	176458	176458
1281.97	175615	175615
1280.97	175515	175515
1279.97	175650	175650
1278.97	176184	176184
1277.97	175945	175945
1276.97	175760	175760
1275.97	175207	175207
1274.97	175090	175090
1273.97	174619	174619
1272.97	174231	174231
1271.97	174801	174801
1270.97	175945	175945
1269.97	174112	174112
1268.97	174482	174482
1267.97	174213	174213
1266.97	174784	174784
1265.97	174575	174575
1264.97	174491	174491
1263.97	174441	174441
1262.97	173387	173387
1261.97	173172	173172

1260.97	173211	173211
1259.97	173210	173210
1258.97	172430	172430
1257.97	172842	172842
1256.97	173155	173155
1255.97	172506	172506
1254.97	172133	172133
1253.97	172160	172160
1252.97	171794	171794
1251.97	171735	171735
1250.97	172448	172448
1249.97	171915	171915
1248.97	172180	172180
1247.97	171662	171662
1246.97	171932	171932
1245.97	171936	171936
1244.97	171481	171481
1243.97	171908	171908
1242.97	171730	171730
1241.97	170995	170995
1240.97	171081	171081
1239.97	171832	171832
1238.97	170633	170633
1237.97	171944	171944
1236.97	171315	171315
1235.97	171260	171260
1234.97	170531	170531
1233.97	171375	171375
1232.97	170712	170712
1231.97	171976	171976
1230.97	171080	171080
1229.97	171480	171480
1228.97	170977	170977
1227.97	171499	171499
1226.97	171403	171403
1225.97	171118	171118
1224.97	170961	170961
1223.97	170202	170202
1222.97	170188	170188
1221.97	170423	170423
1220.97	170534	170534

1219.97	170261	170261
1218.97	170363	170363
1217.97	169571	169571
1216.97	169520	169520
1215.97	169599	169599
1214.97	169609	169609
1213.97	169119	169119
1212.97	169069	169069
1211.97	168679	168679
1210.97	169043	169043
1209.97	168865	168865
1208.97	169117	169117
1207.97	168814	168814
1206.97	168469	168469
1205.97	169014	169014
1204.97	169691	169691
1203.97	170132	170132
1202.97	169359	169359
1201.97	169293	169293
1200.97	168714	168714
1199.97	168971	168971
1198.97	168333	168333
1197.97	169488	169488
1196.97	169124	169124
1195.97	168383	168383
1194.97	168618	168618
1193.97	168487	168487
1192.97	168208	168208
1191.97	167971	167971
1190.97	169671	169671
1189.97	168567	168567
1188.97	168038	168038
1187.97	168992	168992
1186.97	168098	168098
1185.97	168532	168532
1184.97	168029	168029
1183.97	168415	168415
1182.97	168246	168246
1181.97	167940	167940
1180.97	168168	168168
1179.97	168803	168803

1178.97	169044	169044
1177.97	168719	168719
1176.97	168096	168096
1175.97	168433	168433
1174.97	169281	169281
1173.97	169103	169103
1172.97	168658	168658
1171.97	168355	168355
1170.97	168189	168189
1169.97	169218	169218
1168.97	168359	168359
1167.97	167156	167156
1166.97	167991	167991
1165.97	168458	168458
1164.97	168053	168053
1163.97	167766	167766
1162.97	168503	168503
1161.97	168034	168034
1160.97	167486	167486
1159.97	166988	166988
1158.97	167848	167848
1157.97	167510	167510
1156.97	167777	167777
1155.97	167535	167535
1154.97	167382	167382
1153.97	167652	167652
1152.97	167885	167885
1151.97	168308	168308
1150.97	167970	167970
1149.97	168158	168158
1148.97	167770	167770
1147.97	168341	168341
1146.97	168600	168600
1145.97	167996	167996
1144.97	168580	168580
1143.97	168510	168510
1142.97	168494	168494
1141.97	167770	167770
1140.97	167705	167705
1139.97	167834	167834
1138.97	167523	167523

1137.97	167928	167928
1136.97	167826	167826
1135.97	167358	167358
1134.97	168536	168536
1133.97	167533	167533
1132.97	168373	168373
1131.97	168416	168416
1130.97	167694	167694
1129.97	168540	168540
1128.97	168460	168460
1127.97	167960	167960
1126.97	167863	167863
1125.97	168438	168438
1124.97	167628	167628
1123.97	168044	168044
1122.97	167990	167990
1121.97	167958	167958
1120.97	168294	168294
1119.97	167052	167052
1118.97	167164	167164
1117.97	167493	167493
1116.97	167290	167290
1115.97	166828	166828
1114.97	167058	167058
1113.97	166567	166567
1112.97	167091	167091
1111.97	166961	166961
1110.97	166570	166570
1109.97	166495	166495
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74.971	125158	114055
73.971	123361	114043
72.971	120005	114035

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67.971	114355	114026
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65.971	113653	113653
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49.971	114204	114204
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47.971	114238	114238
46.971	114182	114182
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44.971	114150	114150
43.971	113957	113957
42.971	113504	113504
41.971	113787	113787
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27.971	123533	123533
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23.971	119165	119165
22.971	116759	116759
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20.971	113078	113078
19.971	112385	112385
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17.971	111475	111475
16.971	111255	111255
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14.971	111717	111717
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10.971	112047	112047
9.971	112302	112302
8.971	111931	111931
7.971	111851	111851
6.971	111858	111858
5.971	111671	111671
4.971	111038	111038
3.971	110034	110034
2.971	109513	109513
1.971	109291	109291
0.971	109767	109767
-0.029	109903	109903

Mo/AlPO-5 Low Adsorption Sample		
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1299	156458	156458
1298	155944	155944
1297	155898	155898
1296	155232	155232
1295	155201	155201
1294	154816	154816
1293	154847	154847
1292	155043	155043
1291	154553	154553
1290	155319	155319
1289	155428	155428
1288	154429	154429
1287	153837	153837
1286	154069	154069
1285	154811	154811
1284	153459	153459
1283	153524	153524
1282	153538	153538
1281	153095	153095
1280	152884	152884
1279	153108	153108
1278	153622	153622
1277	153008	153008
1276	153132	153132
1275	152830	152830
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497	116362	116362
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495	116939	116939
494	116688	116688
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492	117173	117173
491	116845	116845
490	116881	116881
489	117056	117056
488	117252	117252
487	117041	117041
486	117064	117064
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478	117247	117247
477	117360	117360
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475	117265	117265
474	117373	117373
473	117082	117082
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471	117196	117196
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467	117233	117233
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463	117155	117155
462	117059	117059
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449	117080	117080
448	117270	117270
447	116731	116731
446	117301	117301
445	117238	117238
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443	116797	116797
442	117209	117209

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439	117216	117216
438	117084	117084
437	117330	117330
436	117536	117536
435	117457	117457
434	117461	117461
433	117958	117958
432	117846	117846
431	118143	118143
430	117763	117763
429	117441	117441
428	117317	117317
427	117319	117319
426	117377	117377
425	117333	117333
424	117668	117668
423	117394	117394
422	117370	117370
421	117585	117585
420	117807	117807
419	117418	117418
418	117259	117259
417	117769	117769
416	117494	117494
415	117469	117469
414	118034	118034
413	117595	117595
412	117942	117942
411	117655	117655
410	117500	117500
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407	117433	117433
406	117392	117392
405	117235	117235
404	117484	117484
403	117476	117476
402	117128	117128
401	117737	117737

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389	117756	117756
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384	117902	117902
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380	117440	117440
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378	117199	117199
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369	117461	117461
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363	116876	116876
362	117420	117420
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356	117512	117512
355	117101	117101
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332	118337	118337
331	117995	117995
330	117367	117367
329	117376	117376
328	117645	117645
327	117802	117802
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325	117480	117480
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323	118030	118030
322	117794	117794
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320	117590	117590
319	117862	117862

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313	117617	117617
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311	118074	118074
310	117669	117669
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307	118228	118228
306	118060	118060
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303	118164	118164
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301	118488	118488
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298	117964	117964
297	117922	117922
296	117903	117903
295	117663	117663
294	117838	117838
293	118016	118016
292	118390	118390
291	118120	118120
290	118316	118261
289	118346	118289
288	118951	118318
287	119332	118347
286	119105	118376
285	119736	118405
284	119834	118433
283	119285	118462
282	118999	118491
281	118465	118520
280	118557	118549
279	118796	118577
278	118380	118380

277	117896	117896
276	117952	117952
275	118038	118038
274	118291	118291
273	118105	118105
272	117826	117826
271	117658	117658
270	118187	118187
269	118146	118146
268	117952	117952
267	117928	117928
266	118270	118270
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264	118165	118165
263	118054	118054
262	118064	118064
261	118860	118860
260	118346	118346
259	118341	118341
258	118285	118285
257	118525	118525
256	118207	118207
255	117928	117928
254	118176	118176
253	118369	118369
252	118566	118566
251	118387	118387
250	118936	118936
249	118675	118675
248	118208	118208
247	118557	118557
246	118445	118445
245	118693	118693
244	118839	118839
243	119094	119094
242	118784	118784
241	118467	118467
240	118599	118599
239	119334	119334
238	119535	119535
237	119220	119220

236	119517	119517
235	119567	119567
234	119491	119491
233	119455	119455
232	120142	120142
231	119539	119539
230	119318	119318
229	119399	119399
228	119872	119872
227	119146	119146
226	118894	118894
225	119112	119112
224	118909	118909
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220	118396	118396
219	118770	118770
218	118756	118756
217	119269	119269
216	119329	119329
215	119447	119447
214	119355	119355
213	119607	119607
212	119655	119655
211	119641	119641
210	119634	119634
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208	119015	119015
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204	117939	117939
203	117991	117991
202	117452	117452
201	117529	117529
200	117403	117403
199	117287	117287
198	117122	117122
197	117983	117983
196	118879	118879

195	121274	121274
194	124139	124139
193	125444	125444
192	126034	126034
191	126099	126099
190	124944	124944
189	122672	122672
188	121612	121612
187	120918	120918
186	120076	120076
185	119498	119498
184	118897	118897
183	118277	118277
182	118217	118217
181	117670	117670
180	117449	117449
179	116741	116741
178	116499	116499
177	117263	117263
176	116865	116865
175	116899	116899
174	117051	117051
173	117605	117605
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169	116937	116937
168	116710	116710
167	117585	117585
166	116840	116840
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161	117086	117086
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159	117056	117056
158	117235	117235
157	117496	117496
156	117433	117433
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153	117074	117074
152	117420	117420
151	116728	116728
150	116548	116548
149	116705	116705
148	117091	117091
147	116753	116753
146	116443	116443
145	116001	116001
144	115872	115872
143	115774	115774
142	115317	115317
141	114854	115168
140	115333	115130
139	116378	115086
138	119156	115039
137	123586	114992
136	126656	114948
135	127574	114913
134	126337	114887
133	123517	114870
132	120547	114860
131	117916	114855
130	116253	114853
129	115602	114852
128	115522	114851
127	114766	114851
126	114267	114267
125	114492	114492
124	115708	115708
123	117114	117114
122	120117	120117
121	122377	122377
120	122559	122559
119	121664	121664
118	119623	119623
117	118136	118136
116	115774	115774
115	114990	114990
114	114572	114572

113	114074	114074
112	113810	113810
111	112999	112999
110	112333	112333
109	112039	112039
108	112220	112220
107	111987	111987
106	111992	111992
105	111898	111898
104	112289	112289
103	112182	112182
102	112555	112555
101	112509	112509
100	112049	112049
99	112153	112153
98	112388	112388
97	112362	112362
96	112450	112450
95	111992	111992
94	111843	111843
93	112039	112039
92	112023	112023
91	111507	111507
90	111925	111925
89	111778	111778
88	111656	111656
87	111118	111118
86	111175	111175
85	110635	110635
84	110321	110321
83	110683	110683
82	110470	110470
81	110265	110476
80	110691	110440
79	111872	110400
78	113906	110357
77	116317	110314
76	118094	110275
75	118474	110242
74	116944	110218
73	115058	110199

72	113332	110185
71	112966	110174
70	112113	110166
69	112007	110160
68	111869	110156
67	111383	110154
66	110896	110153
65	110148	110153
64	110170	110153
63	110140	110140
62	110163	110163
61	110121	110121
60	109858	109858
59	110079	110079
58	109911	109911
57	110144	110144
56	110403	110403
55	110530	110530
54	110298	110298
53	110387	110387
52	110457	110457
51	110386	110386
50	110149	110149
49	110324	110324
48	110074	110074
47	110437	110437
46	110445	110445
45	110361	110361
44	110228	110228
43	110485	110485
42	110196	110196
41	110158	110158
40	109993	109993
39	109838	109838
38	110200	110200
37	110045	110045
36	110011	110011
35	109896	109896
34	109475	109475
33	109540	109540
32	110131	110131

31	110579	110579
30	110577	110577
29	111240	111240
28	112159	112159
27	112996	112996
26	113449	113449
25	113109	113109
24	112168	112168
23	110802	110802
22	110345	110345
21	110161	110161
20	109429	109429
19	109423	109423
18	108868	108868
17	109370	109370
16	109490	109490
15	109367	109367
14	109557	109557
13	109503	109503
12	109865	109865
11	109359	109359
10	109284	109284
9	109792	109792
8	109711	109711
7	109454	109454
6	109189	109189
5	108587	108587
4	108236	108236
3	108251	108251
2	108214	108214
1	107941	107941
0	108018	108018

Mo/AlPO-5 High Adsorption Sample		
BE_wide	CPS_wide	Background_wide
1300.04	114242	114242
1299.04	115548	115548
1298.04	114091	114091
1297.04	114778	114778
1296.04	113976	113976
1295.04	113739	113739
1294.04	113911	113911
1293.04	113615	113615
1292.04	115138	115138
1291.04	113980	113980
1290.04	112934	112934
1289.04	112790	112790
1288.04	113183	113183
1287.04	113280	113280
1286.04	112675	112675
1285.04	112352	112352
1284.04	111971	111971
1283.04	112626	112626
1282.04	111951	111951
1281.04	110579	110579
1280.04	111229	111229
1279.04	110906	110906
1278.04	110896	110896
1277.04	111287	111287
1276.04	111432	111432
1275.04	111973	111973
1274.04	110936	110936
1273.04	110938	110938
1272.04	110509	110509
1271.04	111127	111127
1270.04	110692	110692
1269.04	110896	110896
1268.04	110236	110236
1267.04	110558	110558
1266.04	110098	110098
1265.04	110918	110918
1264.04	111120	111120
1263.04	109890	109890
1262.04	110260	110260

1261.04	110296	110296
1260.04	110170	110170
1259.04	110525	110525
1258.04	110287	110287
1257.04	109776	109776
1256.04	109938	109938
1255.04	109048	109048
1254.04	109102	109102
1253.04	109195	109195
1252.04	110163	110163
1251.04	110609	110609
1250.04	109764	109764
1249.04	110081	110081
1248.04	109260	109260
1247.04	109259	109259
1246.04	109755	109755
1245.04	109001	109001
1244.04	110289	110289
1243.04	109272	109272
1242.04	109614	109614
1241.04	109650	109650
1240.04	109299	109299
1239.04	109547	109547
1238.04	109457	109457
1237.04	109703	109703
1236.04	109904	109904
1235.04	109142	109142
1234.04	109311	109311
1233.04	109876	109876
1232.04	109429	109429
1231.04	109617	109617
1230.04	110132	110132
1229.04	109501	109501
1228.04	109681	109681
1227.04	109949	109949
1226.04	108989	108989
1225.04	108974	108974
1224.04	108617	108617
1223.04	108892	108892
1222.04	108778	108778
1221.04	109087	109087

1220.04	108442	108442
1219.04	107772	107772
1218.04	108315	108315
1217.04	108270	108270
1216.04	108105	108105
1215.04	107809	107809
1214.04	107565	107565
1213.04	107748	107748
1212.04	107863	107863
1211.04	108685	108685
1210.04	108094	108094
1209.04	107881	107881
1208.04	107607	107607
1207.04	107939	107939
1206.04	107280	107280
1205.04	107198	107198
1204.04	106960	106960
1203.04	107906	107906
1202.04	107156	107156
1201.04	106890	106890
1200.04	107412	107412
1199.04	107265	107265
1198.04	107772	107772
1197.04	107942	107942
1196.04	107299	107299
1195.04	107240	107240
1194.04	108480	108480
1193.04	107865	107865
1192.04	106641	106641
1191.04	107951	107951
1190.04	106981	106981
1189.04	107090	107090
1188.04	106583	106583
1187.04	107519	107519
1186.04	107842	107842
1185.04	107453	107453
1184.04	107423	107423
1183.04	107992	107992
1182.04	107130	107130
1181.04	107837	107837
1180.04	106966	106966

1179.04	106804	106804
1178.04	107442	107442
1177.04	107952	107952
1176.04	108002	108002
1175.04	108052	108052
1174.04	107375	107375
1173.04	107152	107152
1172.04	107515	107515
1171.04	107331	107331
1170.04	107697	107697
1169.04	108079	108079
1168.04	108197	108197
1167.04	108361	108361
1166.04	108441	108441
1165.04	107201	107201
1164.04	107639	107639
1163.04	107869	107869
1162.04	107958	107958
1161.04	107637	107637
1160.04	107879	107879
1159.04	108571	108571
1158.04	108209	108209
1157.04	107992	107992
1156.04	107998	107998
1155.04	108295	108295
1154.04	108368	108368
1153.04	107778	107778
1152.04	108594	108594
1151.04	108948	108948
1150.04	109117	109117
1149.04	108633	108633
1148.04	108284	108284
1147.04	108499	108499
1146.04	108498	108498
1145.04	108224	108224
1144.04	109270	109270
1143.04	109539	109539
1142.04	109281	109281
1141.04	109162	109162
1140.04	109457	109457
1139.04	109680	109680

1138.04	109672	109672
1137.04	109264	109264
1136.04	109138	109138
1135.04	110052	110052
1134.04	109361	109361
1133.04	109719	109719
1132.04	109611	109611
1131.04	109104	109104
1130.04	109199	109199
1129.04	109463	109463
1128.04	110123	110123
1127.04	110310	110310
1126.04	109614	109614
1125.04	109979	109979
1124.04	109844	109844
1123.04	109900	109900
1122.04	109856	109856
1121.04	109157	109157
1120.04	109755	109755
1119.04	110508	110508
1118.04	110033	110033
1117.04	109161	109161
1116.04	109262	109262
1115.04	110225	110225
1114.04	110088	110088
1113.04	109271	109271
1112.04	110491	110491
1111.04	109759	109759
1110.04	110004	110004
1109.04	110077	110077
1108.04	110067	110067
1107.04	111015	111015
1106.04	110963	110963
1105.04	110255	110255
1104.04	110049	110049
1103.04	110428	110428
1102.04	111056	111056
1101.04	110430	110430
1100.04	110546	110546
1099.04	110369	110369
1098.04	110185	110185

1097.04	110697	110697
1096.04	110384	110384
1095.04	110984	110984
1094.04	111588	111588
1093.04	110872	110872
1092.04	111098	111098
1091.04	110999	110999
1090.04	111086	111086
1089.04	111360	111360
1088.04	111748	111748
1087.04	111527	111527
1086.04	111182	111182
1085.04	111568	111568
1084.04	111939	111939
1083.04	111585	111585
1082.04	112155	112155
1081.04	113056	113056
1080.04	112102	112102
1079.04	111856	111856
1078.04	111037	111037
1077.04	110749	110749
1076.04	110812	110812
1075.04	111475	111475
1074.04	111441	111441
1073.04	111301	111301
1072.04	111306	111306
1071.04	111718	111718
1070.04	111886	111886
1069.04	112794	112794
1068.04	111619	111619
1067.04	112021	112021
1066.04	112101	112101
1065.04	112833	112833
1064.04	112191	112191
1063.04	112114	112114
1062.04	112459	112459
1061.04	112135	112135
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497.041	71068.8	71068.8
496.041	70552.2	70552.2
495.041	70227.3	70227.3
494.041	70392.2	70392.2
493.041	70558.2	70558.2
492.041	70617	70617
491.041	70791.9	70791.9
490.041	70774.3	70774.3
489.041	70753.5	70753.5
488.041	70196.1	70196.1
487.041	69717.5	69717.5
486.041	70159.3	70159.3
485.041	69630.3	69630.3
484.041	69693.9	69693.9
483.041	70231.3	70231.3

482.041	70630.3	70630.3
481.041	70008	70008
480.041	70042.8	70042.8
479.041	69760.3	69760.3
478.041	70436.2	70436.2
477.041	69788.3	69788.3
476.041	69898	69898
475.041	70178.9	70178.9
474.041	70489.4	70489.4
473.041	70617.4	70617.4
472.041	69714.7	69714.7
471.041	69908	69908
470.041	70172.1	70172.1
469.041	70142.9	70142.9
468.041	70433	70433
467.041	69735.9	69735.9
466.041	70203.3	70203.3
465.041	70229.7	70229.7
464.041	70181.3	70181.3
463.041	70455	70455
462.041	69987.6	69987.6
461.041	69970.8	69970.8
460.041	69679.1	69679.1
459.041	69559.4	69559.4
458.041	69759.9	69759.9
457.041	70562.2	70562.2
456.041	70476.6	70476.6
455.041	71000.8	71000.8
454.041	71801.9	71801.9
453.041	71901.2	71901.2
452.041	70885.6	70885.6
451.041	69397.4	69397.4
450.041	69553.8	69553.8
449.041	69329.7	69329.7
448.041	70655.1	70655.1
447.041	72352.1	72352.1
446.041	74341.7	74341.7
445.041	73625.5	73625.5
444.041	70522.6	70522.6
443.041	69353.3	69353.3
442.041	69216.9	69216.9

441.041	68969.6	68969.6
440.041	68560.6	68560.6
439.041	68630.3	68630.3
438.041	68969.6	68969.6
437.041	68625.1	68625.1
436.041	68777.5	68777.5
435.041	68693.1	68693.1
434.041	68915.6	68915.6
433.041	68823.5	68823.5
432.041	69330.5	69330.5
431.041	68990.8	68990.8
430.041	68723.5	68723.5
429.041	68721.1	68721.1
428.041	68621.8	68621.8
427.041	68513.8	68513.8
426.041	69004.4	69004.4
425.041	69162.9	69162.9
424.041	68602.2	68602.2
423.041	68959.6	68959.6
422.041	68947.2	68947.2
421.041	68643.9	68643.9
420.041	68978.4	68978.4
419.041	69236.1	69236.1
418.041	69369.3	69369.3
417.041	68767.9	68767.9
416.041	69485.4	69485.4
415.041	69459.4	69459.4
414.041	68869.5	68869.5
413.041	69131.7	69131.7
412.041	69759.9	69759.9
411.041	69348.1	69348.1
410.041	69174.5	69174.5
409.041	68950.8	68950.8
408.041	69360.5	69360.5
407.041	68982.8	68982.8
406.041	69286.9	69286.9
405.041	68789.5	68789.5
404.041	68690.7	68690.7
403.041	69110	69110
402.041	68718.3	68718.3
401.041	68922.8	68922.8

400.041	69493.4	69493.4
399.041	69473.8	69473.8
398.041	69636.3	69636.3
397.041	69881.2	69881.2
396.041	69696.7	69696.7
395.041	69393.4	69393.4
394.041	69471.4	69471.4
393.041	69974.4	69974.4
392.041	68874.7	68874.7
391.041	68777.5	68777.5
390.041	69219.7	69219.7
389.041	68890.4	68890.4
388.041	68832.7	68832.7
387.041	69090.4	69090.4
386.041	69337.7	69337.7
385.041	68882.4	68882.4
384.041	68640.7	68640.7
383.041	69076.4	69076.4
382.041	69298.5	69298.5
381.041	68779.9	68779.9
380.041	69119.6	69119.6
379.041	69387.8	69387.8
378.041	68627.1	68627.1
377.041	69252.9	69252.9
376.041	69512.6	69512.6
375.041	69739.1	69739.1
374.041	69704.3	69704.3
373.041	68990	68990
372.041	68865.9	68865.9
371.041	69514.2	69514.2
370.041	69333.7	69333.7
369.041	69018	69018
368.041	69298.9	69298.9
367.041	69304.5	69304.5
366.041	69418.6	69418.6
365.041	69048.4	69048.4
364.041	69451.4	69451.4
363.041	68978	68978
362.041	69105.2	69105.2
361.041	69291.7	69291.7
360.041	69421	69421

359.041	69391.8	69391.8
358.041	69491.8	69491.8
357.041	69300.9	69300.9
356.041	69599.8	69599.8
355.041	69456.2	69456.2
354.041	69272.5	69272.5
353.041	69527	69527
352.041	69679.9	69679.9
351.041	69916	69916
350.041	69585.4	69585.4
349.041	70099.2	70099.2
348.041	70074.4	70074.4
347.041	69707.1	69707.1
346.041	69555.8	69555.8
345.041	69553	69553
344.041	70122.8	70122.8
343.041	69390.2	69390.2
342.041	69797.5	69797.5
341.041	69847.5	69847.5
340.041	69722.3	69722.3
339.041	70009.2	70009.2
338.041	69283.7	69283.7
337.041	70070.4	70070.4
336.041	69557.4	69557.4
335.041	69454.6	69454.6
334.041	69825.1	69825.1
333.041	69547	69547
332.041	69568.6	69568.6
331.041	69902.8	69902.8
330.041	70107.2	70107.2
329.041	69941.6	69941.6
328.041	69908.8	69908.8
327.041	69591.8	69591.8
326.041	69846.3	69846.3
325.041	70013.6	70013.6
324.041	69528.6	69528.6
323.041	69242.1	69242.1
322.041	70114	70114
321.041	70059.6	70059.6
320.041	69842.7	69842.7
319.041	69707.9	69707.9

318.041	69601	69601
317.041	69807.9	69807.9
316.041	69930.8	69930.8
315.041	70223.3	70223.3
314.041	69857.9	69857.9
313.041	70517.8	70517.8
312.041	70008.4	70008.4
311.041	70051.6	70051.6
310.041	70080	70080
309.041	70537.4	70537.4
308.041	70385	70385
307.041	70540.6	70540.6
306.041	70887.6	70887.6
305.041	70505.8	70505.8
304.041	70021.2	70021.2
303.041	70327.3	70327.3
302.041	70352.9	70352.9
301.041	70558.2	70558.2
300.041	70296.9	70296.9
299.041	70791.9	70791.9
298.041	70097.2	70097.2
297.041	69698.3	69698.3
296.041	70185.3	70185.3
295.041	69983.2	69983.2
294.041	69675.1	69675.1
293.041	69672.3	69672.3
292.041	70359.3	70359.3
291.041	69890	69890
290.041	69966.8	70010.3
289.041	70174.1	69981.8
288.041	71117.6	69950.2
287.041	72252.5	69918
286.041	73193.7	69887.8
285.041	73519.4	69862
284.041	72823.9	69841.9
283.041	72599	69826.6
282.041	71832.7	69815.9
281.041	71321.7	69808.8
280.041	71069.6	69804.4
279.041	70664.3	69802.4
278.041	70028.4	69801.9

277.041	69238.5	69801.9
276.041	70138.9	70138.9
275.041	70526.6	70526.6
274.041	70046.8	70046.8
273.041	69444.6	69444.6
272.041	70121.6	70121.6
271.041	70077.2	70077.2
270.041	69388.2	69388.2
269.041	70044.4	70044.4
268.041	70362.5	70362.5
267.041	70364.9	70364.9
266.041	70024.8	70024.8
265.041	70414.2	70414.2
264.041	70419.8	70419.8
263.041	70188.9	70188.9
262.041	70513.8	70513.8
261.041	70378.2	70378.2
260.041	70721.1	70721.1
259.041	70722.3	70722.3
258.041	70109.6	70109.6
257.041	70382.6	70382.6
256.041	69963.2	69963.2
255.041	70076	70076
254.041	70399	70399
253.041	70634.7	70634.7
252.041	70663.1	70663.1
251.041	70276.5	70276.5
250.041	70697.9	70697.9
249.041	70620.6	70620.6
248.041	70086.8	70086.8
247.041	70285.3	70285.3
246.041	70611.4	70611.4
245.041	70478.2	70478.2
244.041	70671.1	70671.1
243.041	70523	70523
242.041	70474.6	70474.6
241.041	70533.4	70533.4
240.041	70773.9	70773.9
239.041	70729.5	70729.5
238.041	70677.1	70677.1
237.041	70749.9	70749.9

236.041	71447	71447
235.041	72012	72012
234.041	71917.2	71917.2
233.041	72309.7	72309.7
232.041	71944	71944
231.041	71050.8	71445.5
230.041	71341.7	71252.6
229.041	71153.7	71092.5
228.041	71131.7	70955.4
227.041	71151.7	70842.9
226.041	71261.7	70759.1
225.041	70981.2	70713.9
224.041	71013.6	70688.7
223.041	70718.7	70686.4
222.041	70544.6	70686.4
221.041	70795.9	70795.9
220.041	70734.3	70734.3
219.041	71041.6	71041.6
218.041	70846.3	70846.3
217.041	71273.7	71273.7
216.041	71054	71054
215.041	71677.1	71677.1
214.041	71239.7	71239.7
213.041	71588.2	71588.2
212.041	71198.5	71198.5
211.041	71675.9	71675.9
210.041	71681.5	71681.5
209.041	71188.1	71188.1
208.041	70959.2	70959.2
207.041	70926.4	70926.4
206.041	70324.1	70324.1
205.041	70549.8	70549.8
204.041	69697.9	69697.9
203.041	69535.4	69535.4
202.041	69389.8	69389.8
201.041	69121.6	69121.6
200.041	68939.2	68939.2
199.041	69224.9	69224.9
198.041	69108	69108
197.041	69490.6	69490.6
196.041	69704.7	69704.7

195.041	71321.7	71321.7
194.041	75131.3	75131.3
193.041	78535.4	78535.4
192.041	81556.6	81556.6
191.041	81791.9	81791.9
190.041	79454.6	79454.6
189.041	76607.8	76607.8
188.041	74198.5	74198.5
187.041	72837.1	72837.1
186.041	72258.9	72258.9
185.041	71202.5	71202.5
184.041	70536.2	70536.2
183.041	70268.9	70268.9
182.041	69637.9	69637.9
181.041	69086.4	69086.4
180.041	68872.7	68872.7
179.041	68651.5	68651.5
178.041	69050.8	69050.8
177.041	68310.9	68310.9
176.041	68497.8	68497.8
175.041	68450.6	68450.6
174.041	68493.4	68493.4
173.041	68416.6	68416.6
172.041	68624.2	68624.2
171.041	69285.7	69285.7
170.041	68650.3	68650.3
169.041	68544.2	68544.2
168.041	68864.3	68864.3
167.041	68857.1	68857.1
166.041	68339.7	68339.7
165.041	69071.6	69071.6
164.041	68972.8	68972.8
163.041	68203.3	68203.3
162.041	68379	68379
161.041	68718.7	68718.7
160.041	69039.6	69039.6
159.041	68916.4	68916.4
158.041	69500.6	69500.6
157.041	69532.6	69532.6
156.041	69461.8	69461.8
155.041	69649.9	69649.9

154.041	69721.5	69721.5
153.041	69543	69543
152.041	69540.6	69540.6
151.041	69088.4	69088.4
150.041	68720.7	68720.7
149.041	68370.5	68370.5
148.041	68115.2	68115.2
147.041	67793.5	67793.5
146.041	67794.7	67794.7
145.041	67657.1	67657.1
144.041	67519.8	67519.8
143.041	67086.4	67086.4
142.041	66595.4	66595.4
141.041	66952	66777.5
140.041	66785.1	66618.4
139.041	67261.7	66437.4
138.041	69496.6	66238.4
137.041	74331.3	66030.6
136.041	81542.6	65830.8
135.041	85160.9	65662.6
134.041	83223.3	65539.4
133.041	78752.7	65459
132.041	73788.3	65411.4
131.041	70157.3	65384.8
130.041	67797.9	65370.2
129.041	66969.6	65361.6
128.041	66405.4	65357.1
127.041	66005.2	65355.4
126.041	65362.9	65355.3
125.041	64697.9	64697.9
124.041	65396.2	65396.2
123.041	67668.7	67668.7
122.041	71243.3	71243.3
121.041	75675.9	75675.9
120.041	76149.7	76149.7
119.041	74437.4	74437.4
118.041	71534.6	71534.6
117.041	69387	69387
116.041	66974.8	66974.8
115.041	65831.9	65831.9
114.041	65319.3	65319.3

113.041	65123.6	65123.6
112.041	64306.1	64306.1
111.041	63570.2	63570.2
110.041	62991.2	62991.2
109.041	62764.3	62764.3
108.041	62605	62605
107.041	62499	62499
106.041	61762.7	61762.7
105.041	61483.8	61483.8
104.041	61963.2	61963.2
103.041	62239.7	62239.7
102.041	62639.1	62639.1
101.041	62835.5	62835.5
100.041	63103.2	63103.2
99.041	62901.6	62901.6
98.041	62764.7	62764.7
97.041	62940.4	62940.4
96.041	63287.3	63287.3
95.041	63218.1	63218.1
94.041	62743.9	62743.9
93.041	62545	62545
92.041	62683.5	62683.5
91.041	62559	62559
90.041	62439.8	62439.8
89.041	62356.1	62356.1
88.041	62352.5	62352.5
87.041	62522.2	62522.2
86.041	61793.9	61793.9
85.041	61922	61922
84.041	61506.2	61506.2
83.041	60959.6	60959.6
82.041	61421.8	61218.2
81.041	61273.3	61259.5
80.041	61585	61300.8
79.041	62820.7	61342.1
78.041	65810.7	61383.3
77.041	69182.9	61424.6
76.041	70913.6	61465.9
75.041	71300.1	61507.2
74.041	68524.6	61548.5
73.041	65953.6	61589.7

72.041	63807.5	61631
71.041	62521.4	61672.3
70.041	62194.1	61713.6
69.041	62060.4	61754.8
68.041	61948	61796.1
67.041	61984.8	61837.4
66.041	61579.4	61579.4
65.041	60868.7	60868.7
64.041	60929.6	60929.6
63.041	60692.3	60692.3
62.041	60518.2	60518.2
61.041	60704.3	60704.3
60.041	60648.3	60648.3
59.041	60528.6	60528.6
58.041	60831.1	60831.1
57.041	60883.6	60883.6
56.041	60563	60563
55.041	60697.1	60697.1
54.041	60734.7	60734.7
53.041	60369.7	60369.7
52.041	60632.7	60632.7
51.041	61173.7	61173.7
50.041	61258.9	61258.9
49.041	61166.9	61166.9
48.041	60865.5	60865.5
47.041	61038.4	61038.4
46.041	60990	60990
45.041	61053.2	61053.2
44.041	61057.2	61057.2
43.041	60990.8	60990.8
42.041	60900	60900
41.041	60942.8	60942.8
40.041	60750.3	60750.3
39.041	60557.8	60557.8
38.041	60445	60445
37.041	60068.4	60068.4
36.041	60266.9	60266.9
35.041	60207.3	60207.3
34.041	60416.6	60416.6
33.041	60519.4	60519.4
32.041	60810.3	60810.3

31.041	61098.8	61098.8
30.041	61508.6	61508.6
29.041	62386.2	62386.2
28.041	63468.6	63468.6
27.041	64859.1	64859.1
26.041	64893.2	64893.2
25.041	64489.4	64489.4
24.041	63256.9	63256.9
23.041	62215.3	62215.3
22.041	61179.3	61179.3
21.041	60900.4	60900.4
20.041	60935.2	60935.2
19.041	60553.8	60553.8
18.041	60545	60545
17.041	60288.9	60288.9
16.041	60142.9	60142.9
15.041	60267.3	60267.3
14.041	60236.5	60236.5
13.041	60543.4	60543.4
12.041	60018.4	60018.4
11.041	60239.7	60239.7
10.041	60173.3	60173.3
9.041	60491.4	60491.4
8.041	60493	60493
7.041	60140.5	60140.5
6.041	59246.5	59246.5
5.041	59165.3	59165.3
4.041	58816.7	58816.7
3.041	58479.4	58479.4
2.041	58437.4	58437.4
1.041	58619.4	58619.4
0.041	57941.6	57941.6

MnSnSi/AlPO-5			
wide			
	Characteristic Energy eV	1486.6	Acquisition Time s
KE_wide	BE_wide	CPS_wide	Background_wide
183.563	1303.04	233228	233228
184.563	1302.04	234578	234578
185.563	1301.04	233615	233615
186.563	1300.04	234033	234033
187.563	1299.04	234323	234323
188.563	1298.04	233928	233928
189.563	1297.04	233621	233621
190.563	1296.04	233589	233589
191.563	1295.04	234461	234461
192.563	1294.04	234162	234162
193.563	1293.04	234280	234280
194.563	1292.04	233831	233831
195.563	1291.04	234200	234200
196.563	1290.04	234075	234075
197.563	1289.04	233296	233296
198.563	1288.04	233853	233853
199.563	1287.04	232547	232547
200.563	1286.04	232649	232649
201.563	1285.04	232528	232528
202.563	1284.04	233584	233584
203.563	1283.04	233555	233555
204.563	1282.04	232970	232970
205.563	1281.04	232803	232803
206.563	1280.04	232782	232782
207.563	1279.04	232359	232359
208.563	1278.04	232853	232853
209.563	1277.04	232768	232768
210.563	1276.04	233104	233104
211.563	1275.04	232582	232582
212.563	1274.04	232750	232750
213.563	1273.04	232730	232730
214.563	1272.04	233079	233079
215.563	1271.04	232446	232446
216.563	1270.04	232256	232256
217.563	1269.04	232178	232178
218.563	1268.04	232228	232228
219.563	1267.04	231997	231997

220.563	1266.04	232128	232128
221.563	1265.04	232336	232336
222.563	1264.04	231386	231386
223.563	1263.04	232142	232142
224.563	1262.04	232130	232130
225.563	1261.04	231522	231522
226.563	1260.04	232009	232009
227.563	1259.04	232616	232616
228.563	1258.04	232130	232130
229.563	1257.04	232008	232008
230.563	1256.04	232250	232250
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1225.56	261.037	196427	196427
1226.56	260.037	196593	196593
1227.56	259.037	196732	196732
1228.56	258.037	196740	196740
1229.56	257.037	196602	196602
1230.56	256.037	196602	196602
1231.56	255.037	196390	196390
1232.56	254.037	196070	196070
1233.56	253.037	196620	196620
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1235.56	251.037	197186	197186
1236.56	250.037	196471	196471
1237.56	249.037	196802	196802
1238.56	248.037	196897	196897
1239.56	247.037	197097	197097
1240.56	246.037	197260	197260
1241.56	245.037	197078	197078
1242.56	244.037	196900	196900
1243.56	243.037	196449	196449
1244.56	242.037	197060	197060

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1246.56	240.037	198204	198204
1247.56	239.037	198458	198458
1248.56	238.037	198058	198058
1249.56	237.037	197792	197792
1250.56	236.037	198191	198191
1251.56	235.037	198357	198357
1252.56	234.037	198235	198235
1253.56	233.037	198091	198091
1254.56	232.037	198277	198277
1255.56	231.037	198290	198290
1256.56	230.037	197946	197946
1257.56	229.037	198027	198027
1258.56	228.037	198232	198232
1259.56	227.037	198463	198463
1260.56	226.037	198667	198667
1261.56	225.037	198698	198698
1262.56	224.037	198378	198378
1263.56	223.037	198354	198354
1264.56	222.037	198301	198301
1265.56	221.037	198376	198376
1266.56	220.037	198622	198622
1267.56	219.037	198751	198751
1268.56	218.037	199282	199282
1269.56	217.037	199298	199298
1270.56	216.037	199141	199141
1271.56	215.037	199508	199508
1272.56	214.037	199564	199564
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1274.56	212.037	198836	198836
1275.56	211.037	198906	198906
1276.56	210.037	198893	198893
1277.56	209.037	198678	198678
1278.56	208.037	198369	198369
1279.56	207.037	198118	198118
1280.56	206.037	197850	197850
1281.56	205.037	197193	197193
1282.56	204.037	197407	197407
1283.56	203.037	196827	196827
1284.56	202.037	196557	196557
1285.56	201.037	197352	197352

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1287.56	199.037	197087	197087
1288.56	198.037	198388	198388
1289.56	197.037	200759	200759
1290.56	196.037	204734	204734
1291.56	195.037	208833	208833
1292.56	194.037	210840	210840
1293.56	193.037	209102	209102
1294.56	192.037	205306	205306
1295.56	191.037	202690	202690
1296.56	190.037	201421	201421
1297.56	189.037	200467	200467
1298.56	188.037	200011	200011
1299.56	187.037	199696	199696
1300.56	186.037	198617	198617
1301.56	185.037	197414	197414
1302.56	184.037	196607	196607
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1304.56	182.037	195787	195787
1305.56	181.037	196218	196218
1306.56	180.037	196055	196055
1307.56	179.037	195971	195971
1308.56	178.037	195971	195971
1309.56	177.037	195634	195634
1310.56	176.037	195264	195264
1311.56	175.037	195045	195045
1312.56	174.037	195226	195226
1313.56	173.037	195407	195407
1314.56	172.037	195064	195064
1315.56	171.037	195368	195368
1316.56	170.037	194283	194283
1317.56	169.037	193892	193892
1318.56	168.037	193463	193463
1319.56	167.037	193886	193886
1320.56	166.037	194104	194104
1321.56	165.037	193806	193806
1322.56	164.037	194070	194070
1323.56	163.037	194481	194481
1324.56	162.037	194869	194869
1325.56	161.037	195108	195108
1326.56	160.037	194339	194339

1327.56	159.037	194841	194841
1328.56	158.037	194953	194953
1329.56	157.037	195155	195155
1330.56	156.037	195193	195193
1331.56	155.037	195600	195600
1332.56	154.037	194676	194676
1333.56	153.037	194029	194029
1334.56	152.037	193646	193646
1335.56	151.037	193587	193587
1336.56	150.037	193628	193628
1337.56	149.037	193008	193008
1338.56	148.037	192480	192480
1339.56	147.037	192526	192526
1340.56	146.037	191974	191974
1341.56	145.037	192058	192058
1342.56	144.037	191488	191488
1343.56	143.037	191404	191404
1344.56	142.037	191637	191637
1345.56	141.037	192968	192968
1346.56	140.037	196859	196859
1347.56	139.037	204311	204311
1348.56	138.037	211424	211424
1349.56	137.037	211974	211974
1350.56	136.037	206914	206914
1351.56	135.037	199966	199966
1352.56	134.037	195229	195229
1353.56	133.037	193442	193442
1354.56	132.037	192761	192761
1355.56	131.037	192663	192663
1356.56	130.037	192502	192502
1357.56	129.037	191306	191306
1358.56	128.037	190839	190839
1359.56	127.037	190004	190004
1360.56	126.037	191311	191311
1361.56	125.037	194431	194431
1362.56	124.037	198866	198866
1363.56	123.037	200695	200695
1364.56	122.037	199910	199910
1365.56	121.037	196184	196184
1366.56	120.037	193321	193321
1367.56	119.037	191642	191642

1368.56	118.037	190874	190874
1369.56	117.037	190729	190729
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1371.56	115.037	190456	190456
1372.56	114.037	190087	190087
1373.56	113.037	189245	189245
1374.56	112.037	188628	188628
1375.56	111.037	188775	188775
1376.56	110.037	188606	188606
1377.56	109.037	188560	188560
1378.56	108.037	188838	188838
1379.56	107.037	188854	188854
1380.56	106.037	188571	188571
1381.56	105.037	188531	188531
1382.56	104.037	188658	188658
1383.56	103.037	188817	188817
1384.56	102.037	188765	188765
1385.56	101.037	188396	188396
1386.56	100.037	188488	188488
1387.56	99.037	188898	188898
1388.56	98.037	188600	188600
1389.56	97.037	188331	188331
1390.56	96.037	188279	188279
1391.56	95.037	188301	188301
1392.56	94.037	188377	188377
1393.56	93.037	188290	188290
1394.56	92.037	188086	188086
1395.56	91.037	188211	188211
1396.56	90.037	187760	187760
1397.56	89.037	187355	187355
1398.56	88.037	187843	187843
1399.56	87.037	187752	187752
1400.56	86.037	187183	187183
1401.56	85.037	187352	187352
1402.56	84.037	186852	186852
1403.56	83.037	186838	186838
1404.56	82.037	187641	187641
1405.56	81.037	189648	189648
1406.56	80.037	193216	193216
1407.56	79.037	196404	196404
1408.56	78.037	196536	196536

1409.56	77.037	193613	193613
1410.56	76.037	190622	190622
1411.56	75.037	188885	188885
1412.56	74.037	188483	188483
1413.56	73.037	188260	188260
1414.56	72.037	188365	188365
1415.56	71.037	188157	188157
1416.56	70.037	187704	187704
1417.56	69.037	187333	187333
1418.56	68.037	187065	187065
1419.56	67.037	187058	187058
1420.56	66.037	187485	187485
1421.56	65.037	187459	187459
1422.56	64.037	186697	186697
1423.56	63.037	187250	187250
1424.56	62.037	187619	187619
1425.56	61.037	186934	186934
1426.56	60.037	187538	187538
1427.56	59.037	187600	187600
1428.56	58.037	187430	187430
1429.56	57.037	187102	187102
1430.56	56.037	187370	187370
1431.56	55.037	187204	187204
1432.56	54.037	187636	187636
1433.56	53.037	187789	187789
1434.56	52.037	187950	187950
1435.56	51.037	187574	187574
1436.56	50.037	186909	186909
1437.56	49.037	187003	187003
1438.56	48.037	186852	186852
1439.56	47.037	186970	186970
1440.56	46.037	187727	187727
1441.56	45.037	187372	187372
1442.56	44.037	187206	187206
1443.56	43.037	186525	186525
1444.56	42.037	186612	186612
1445.56	41.037	186892	186892
1446.56	40.037	186374	186374
1447.56	39.037	185727	185727
1448.56	38.037	186031	186031
1449.56	37.037	186467	186467

1450.56	36.037	186301	186301
1451.56	35.037	186285	186285
1452.56	34.037	187598	187598
1453.56	33.037	187235	187235
1454.56	32.037	187812	187812
1455.56	31.037	188801	188801
1456.56	30.037	189819	189819
1457.56	29.037	190394	190394
1458.56	28.037	190013	190013
1459.56	27.037	188526	188526
1460.56	26.037	187025	187025
1461.56	25.037	185530	185530
1462.56	24.037	184674	184674
1463.56	23.037	184739	184739
1464.56	22.037	184820	184820
1465.56	21.037	185207	185207
1466.56	20.037	185124	185124
1467.56	19.037	185246	185246
1468.56	18.037	185234	185234
1469.56	17.037	185326	185326
1470.56	16.037	185373	185373
1471.56	15.037	185291	185291
1472.56	14.037	184955	184955
1473.56	13.037	185577	185577
1474.56	12.037	185517	185517
1475.56	11.037	185282	185282
1476.56	10.037	184861	184861
1477.56	9.037	184577	184577
1478.56	8.037	184073	184073
1479.56	7.037	184276	184276
1480.56	6.037	184094	184094
1481.56	5.037	184079	184079
1482.56	4.037	183411	183411
1483.56	3.037	183730	183730