

Summer report 2017

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This is going to be the last year of my PhD program. My PI and I agreed that I will be done by next spring quarter 2018. I was planning to done before winter 2017 but instruments that I was going to use were delayed and my PI wants me to TA her class in the winter quarter 2018, so I decided to finish writing my thesis by the end of this year and use the extra three month for wrapping up and job hunting.

This is my 5<sup>th</sup> year and I will be done in 4.5 years since I started in fall 2013. I have gained so many skills and connections, not to mention knowledge in different fields and I can feel confidence in me which I did not have enough when I first started the PhD program. I would like to talk about what I have been up to and what I think is really important to pursue a PhD degree.

In my last report I mentioned that I had conferences lined up after coming back from the research in Germany. After those conferences, I felt that I can take a break from attending conferences for a while since data collection and analysis have been busy and attending conferences takes time not just the conferences themselves but also to prepare for them. So I told my PI that the next conference is going to be my last conference before I graduate, which is going to be International Conference and Expo on Advanced Ceramics and Composites in Florida on January 21-26 2018. I will be presenting my work on radiation damage behavior in multiphase ceramics (YSZ,  $A_2O_3$  and  $MgAl_2O_4$ ) using 1 GeV Au ions. The results from the samples irradiated in Germany is finally put together showing very interesting behaviors. When accelerated ions enter ionic materials, they interact with electrons and nuclei of the target material generating defects in the crystals. By using X-ray diffraction and electron microscopy, the damage can be quantified and visually observed. X-ray result is showing that the lattice of the ceramic materials expanded with increasing dosage but the amount of expansion in the multiphase sample was smaller than single phase materials suggesting that having multiple phases enhanced radiation damage tolerance. The theory for this is that the interfaces between dissimilar phases is disordered allowing defects to be annihilated more easily than at grain boundaries in single phase materials. This work can be

related to the earlier work of mine with Si ion irradiation which will be submitted for publication soon. I will spend this whole summer finishing up with data collection so that I can concentrate on analysis during fall.

In the course of a PhD program, I have seen and experienced various obstacles and I will more this year for sure. I have seen several friends dropping out of their PhD program and finish with a master's degree and I also have seen new PhD students and candidates coming in for 4 years so far. Seeing them and look back at myself and my colleagues, I think dedication is the most important component to finish a PhD program. If you are not sure about what you are doing and if you doubt that the career path you are taking does not suit you, you won't be able to stay in the PhD program because you will face so many obstacles and your strong will can only allow you to overcome those. Almost every single grad students are stressed about their projects and want to be done with them but a lot of them genuinely love what they are doing and that is what stress them because we seek the answers so hard. Dedication also makes students self-motivated which I see a lot in new students. Every time new PhD students come in for rotations, I can almost tell who will find matching group and who won't. Most rotation students are treated as a burden because majority of them will not yield any resourceful data during their rotation period. Therefore most of times, they are left to themselves not knowing what to do. Those who come to senior students asking if they can come with us to observe what we are doing and those who are willing to learn new things are more likely to success in their PhD program. This sounds really obvious but it is difficult to do and easy to do otherwise. Motivation is what drives you and what people in the academia would like to pick up and I believe it comes from your dedication. I did not think I will be so deeply in love with the field I am in now but thanks to that, I think I can survive in any career path as long as I can stay in materials science field.

I am excited to report more good news in the next report.