

Madeleine Kelly

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The Goldstein award will be used for flights to and from the University of Manchester or for the overnight accommodation at a rented apartment (Airbnb) during my stay. The remainder of the costs (transportation and food expenses) was provided by a grant under my advisor, Dr. Gregory Rohrer.

At the University of Manchester first I got to take a tour of their state of the art facilities. There, I collaborated with Marygrace Burke and the experimental officer of the FEI Helios<sup>TM</sup> plasma focused ion beam Dual-Beam, Xiangli Zhong. It was interesting to learn how their microscopy facility is set up, the day-to-day operations and the management of each instrument. I thought it was especially interesting that they have an experimental officer in charge of each instrument, which allows for less down time of the microscopes if something should break. While there, Xiangli and I worked on collecting a 3D dataset of serial sectioned orientation maps of a strontium titanate sample annealed at 1390 °C.

Setting up the data collection, Xiangli taught me many techniques for electron microscopy. I learned her insight on how to properly align the electron column and I learned the importance of determining the pixel resolution of an image for the auto slice and view software to cut each serial section. In addition, I learned how to better deposit platinum on the surface of my sample from the ion beam which I was novice to.

Comparing the FEI Helios<sup>TM</sup> PFIB Dual-Beam from the University of Manchester to the PFIB at Carnegie Mellon University, I noticed that there were some differences in the camera quality for orientation mapping acquisition. The camera at the University of Manchester appeared to collect patterns faster with the same quality as the patterns which have to be collected at slower speeds at Carnegie Mellon. This is useful information for the director of our Materials Characterization Facility to communicate with FEI in order to ensure that we get the same quality of equipment as other universities receive.

At the University of Manchester, I not only learned a lot from the experts of the FEI Helios<sup>TM</sup> PFIB Dual-Beam but I was also able to teach them about the post processing of the three dimensional data as well as show them some statistical characterization that can be done on these three dimensional volumes. I taught Xiangli how to use DREAM.3D for reconstruction and cleanup of the orientation maps and I showed her how she can statistically analyze her data by calculating grain boundary character distributions.

The three dimensional volume of parallel orientation maps of SrTiO<sub>3</sub> annealed at 1390 °C that I collected at the University of Manchester via FEI Helios<sup>TM</sup> PFIB Dual-Beam will be used to determine if there is a difference in internal dihedral angles of the bimodal microstructure which will give us information onto the changes in grain boundary energy associated with an anti-thermal grain growth transition in this material.

Again, I thank you for this opportunity and wish you all the best.

Madeleine N. Kelly