

## Fiona Strobridge Report 2013

When I was awarded the CSAR bursary this year, I used the money to go towards my trip to Argonne National Laboratory, just outside Chicago. I was carrying out two, weeklong experiments at the national facility, The Advanced Photon Source, in order to gain unprecedented insight into a promising cathode material,  $\text{LiFePO}_4$ , which has received a lot of attention for use in lithium ion batteries for electric vehicles. Luck must have been on my side, as President Barack Obama announced he was to give some "remarks" about his support for clean technology directly outside my office and then use my office as his "preparation room" for his visit. It was incredible. As the week passed, more and more items were brought into the office, all of which had "POTUS" written on them (The President of the United States) and had the presidential seal. It was exciting to see the behind-the-scenes work and the necessary preparations for just a 50 minute appearance. Seeing him talk was really inspiring. He brought with him the most calming atmosphere. He started with a joke about us staying standing after he entered and asked if we couldn't afford chairs after the sequester, which went down with a laugh. He must have thought we were a quiet crowd as at one point he said, "yes, I think that deserves an applause", so then the room erupted with applause. It was quite a small audience, so when he finished I rushed to the front to get a handshake and even though I was in the second row, I stretched my arm out in hope he could see me. I didn't expect him to shake my hand, but when he did, he looked at me expectantly as if I should've said something, so I panicked and all I could muster together was "thank-you" in a very meek mumble tone. The whole experience was amazing. Hearing him talk about electric vehicles and the drive away from combustion fuel vehicles was really enthusing. I feel so lucky to have been given this unique opportunity. Here are a few of photos showing President Barack Obama, Obama at the stand and me in the audience on the right, and the presidential seal.





## **Presentation given to members of CSAR on 21st Oct 2013**

Fiona says:  $\text{LiFePO}_4$  is a promising cathode material for lithium ion batteries for use in hybrid, plug-in hybrid and all-electric vehicles and for use in grid storage to accommodate the fluctuating intermittent renewable sources. It has good high-rate performance when nano-sized and is already used in commercial applications. In order to decrease the cost, improve energy density and facilitate the scale-up challenge, thicker electrodes are desirable. This requires good ion transport throughout the electrode to ensure that the reaction is occurring homogeneously throughout the electrode, which prevents charge build-up and allows the particles to achieve the high rate capabilities. We have developed a technique using synchrotron X-rays to probe the reaction front moving through the electrode. The hard X-rays are able to penetrate the stainless steel coin cell casing, which means that there has been no modification to the cell design and is able to provide accurate insight into the performance of the electrode in a real cycling conditions and in real time. We have observed a lag in 3-dimensions throughout the cathode and will use this to simulate the lithium transport in the electrode. Looking forward this technique can be used to test films with decreased tortuosity, which show promise of better lithium ion transport and a more homogeneous reaction.