

## 2018 GSRAC Visit Summary

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### *Measurement of the structure factor and pair distribution function of aqueous solutions using high-energy X-ray scattering (HEXS)*

During the summer of 2018 I participated in NSF's ChemMatCARS outreach program. Thanks to this program I had the opportunity to spend two months working at NSF's ChemMatCARS facility at Sector 15, Advanced Photon Source (APS), Argonne National Laboratory (ANL). I heard about this program from Scott Barton, Ph.D., director of SAXLAB A Xenocs company, who told me about this program and put me in contact with Binhua Lin, director of ChemMatCARS program.

When I arrived at ChemMatCARS my objective was to learn as much as possible about techniques in the X-ray physics field, because that is the area in which I am looking to pursue my Ph.D. in the near future. During this, my first experience at ChemMatCARS, I worked under the tutelage of Professor Mark Schlossman, who was leading a six-person team in a project aimed at developing a new technique to measure the structure factor and the pair distribution function of aqueous solutions using high-energy X-ray scattering (HEXS), in the reflection mode. For this purpose, a reflection mode measurement of the structure factor of erbium ions in aqueous solution was studied with the goal of developing a technique to measure interfacial (humid helium gas and a  $\text{ErCl}_3$  aqueous solution), structure factors.

The data that we obtained of scattering volume will be normalized to collapse the data measured above the critical angle for different experimental setups to one master curve; looking for a good agreement with the structure factor and Er pair distribution function measured in the conventional transmission mode previously reported.

In the past I have had experience working with the single crystal X-ray diffraction technique. The equipment used for the X-ray experiments was a BRUKER Prospector  $\mu$ source (Cu  $K\alpha$ ) single X-ray Diffractometer coupled with an APEX II CCD Detector, along with the programs supported by Bruker |SHELXL|SADABS, etc. I had received training with this equipment in order to elucidate the crystal structure of the novel inorganic-molecular polymer  $\text{K}_2\text{SeO}_4 \cdot \text{H}_2\text{SeO}_3$ . But I had never had the opportunity to collect data at a synchrotron.

Overall my experience at NSF's ChemMatCARS was one of the most rewarding experiences of my life. Being part of a research group in this place had been one of my dreams for many years. The facilities offered by ChemMatCARS allow us to do cutting-edge research and solve questions that science has not yet been able to answer, which is why I look forward to continuing to work in laboratories that will use facilities in ChemMatCARS at APS. I feel so grateful to the researchers at ChemMatCARS, (especially to Wei Bu, the beamline scientist who worked with me) for their disposition to teach me and to help me succeed in my project. This summer research internship in ChemMatCARS affirmed my wish to do my

Ph.D. in X-ray physics field and to want to continue working in research environment like the one in APS, and why not become a beam line scientific in the future.