

2019 GSRAC Visit Summary, NSF's ChemMatCARS

Paola León Plata
Chemical Engineering Department
University of Illinois at Chicago
Advisor: Dr. Ying Liu
pleonp2@uic.edu

Focus: *Interaction of lipids with a newly synthesized prodrug for cancer treatment*
Goal: *A formulation and delivery strategy that will reduce side effects*

My participation in the Graduate Student Research Award program at NSF's ChemMatCARS (GSRAC) was an exciting learning experience. I heard about the opportunity to have hands-on experience in interfacial X-ray techniques during one of our group's visits for regular beamtime at APS, sector 15-ID. This program will help me be a better member of my research group by giving me a clearer and deeper understanding of the results my lab-mates present after reflectivity and grazing incident X-ray diffraction (GIXD) experiments. Additionally, it offered me a new perspective on the way to study molecular interactions in the development of materials for drug delivery and cell delivery, which is the main focus of my dissertation.

Although we are local, from University of Illinois at Chicago (UIC), we chose to stay at the on-site hotel. My stay was enhanced by the short bike commute from the hotel to the sector, which, during the six weeks of our stay, starting in late May, let us appreciate full spring and enjoy the quietness and nature surrounding Argonne National Laboratory.

During my stay, I partnered with my lab-mate Tiep Pham to study the interfacial properties, interactions, and packing of an anticancer prodrug with different lipids; the goal is the design of liposome systems for efficient drug delivery. Our official weekly progress meetings were enriched by additional lectures on instrumentation, mathematical models of surface X-ray techniques, and data analysis, where fruitful conversations with Dr. Wei Bu and program director Dr. Binhua Lin led to new findings for our prodrug-lipid system.

Beamline scientists Dr. Wei Bu and Dr. Mrinal Bera often stopped by our cubicle on their way for coffee or at group lunch time and answered our questions. These spontaneous meetings eased our reading time by helping us understand the heavy math and physics from "basic" X-ray theory. This training proved to be exceptional, since we could have continuous feedback and advice from Dr. Wei Bu on our research plan and interpretation of our sometimes-erratic results. His help was especially valued after sleepless nights on the experiment floor or full days in the wet lab. On the other hand, the instructional lectures gained reality once we were at the hutch and deciphering the already-written macros that manipulate the heavy machinery that gets a little but very powerful X-ray beam onto the surface of our samples.

In addition to our first-hand training, we were able to interact with regular beamline users and discuss their projects, opening our horizons to multiple systems and endless experiment possibilities. Although X-ray surface techniques are not the core of my dissertation, I am eager to continue exploring in the near future their advantages beyond drug delivery.