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Hands-On Training in Synchrotron-Based Geochemistry Through SEES

EMILY PADSTON[1,2] AND ANDREW CAMPBELL[1,2]

[1]University of Chicago
[2]Synchrotron Earth and Environmental Science (SEES)

The Synchrotron Earth and Environmental Science (SEES) program is an NSF-supported initiative that manages geoscience-focused beamlines across four U.S. DOE facilities: the Advanced Light Source (ALS) at Lawrence Berkeley National Laboratory, the Advanced Photon Source (APS) at Argonne National Laboratory, the National Synchrotron Light Source II (NSLS-II) at Brookhaven National Laboratory, and the Stanford Synchrotron Radiation Lightsource (SSRL) at SLAC National Accelerator Laboratory. By connecting resources and expertise across these sites, SEES strengthens shared research infrastructure and makes a wide range of synchrotron techniques accessible for studying processes from deep Earth dynamics to near-surface and environmental geochemistry. Among the synchrotron methods most often used by the geochemistry community are X-ray absorption spectroscopy, X-ray fluorescence mapping, and infrared spectroscopy.

A substantial portion of SEES users are graduate students and postdoctoral researchers, and beamtime serves as intensive, hands-on training in synchrotron-based Earth and environmental science. Users work side-by-side with beamline scientists, gaining practical experience in experimental design, instrumentation, and interpretation that is difficult to replicate elsewhere. These visits offer space to ask questions, troubleshoot in real time, and connect geochemical concepts directly to measurement. At the same time, SEES is looking for ways to make these opportunities more visible and accessible to new users, including those at institutions with less prior exposure to large-scale facilities and growing areas of geoscience that have not traditionally used synchrotron techniques. Outreach efforts at the host laboratories also introduce undergraduate and high school students to Earth and environmental science using synchrotron facilities, giving them an early look at how these tools are used. Through these efforts, SEES helps grow a community of geochemists who use synchrotron facilities in their research.