EMSL Radiochemistry Annex: A New International User-Facility for the Study of Radiological Samples

NANCY J. HESS [1]

[1]EMSL, Pacific Northwest National Laboratory, Richland WA 99354 USA (nancy.hess@pnnl.gov)

The Radiochemistry Annex, a new state-of-the-art laboratory to facilitate the application of advanced analytical methods to the study of samples containing radionuclides, has been established at EMSL, the Environmental Molecular Sciences Laboratory, a U.S. Department of Energy Office of Biological and Environmental Research user facility located at Pacific Northwest National Laboratory in Richland, Washington. It supports world-class research in the biological, chemical and environmental sciences to provide solutions to the U.S.'s environmental challenges. EMSL's distinctive focus on integrating computational and experimental capabilities, as well as collaborating among disciplines, yields a strong synergistic scientific environment.

Critical determinants of radionuclide mobility are oxidation state, chemical speciation, and formation of surface and aqueous complexes. Understanding how environmental conditions impact these determinants is key to predictive modelling of radionuclide fate and transport in environmental systems as well as stability of wasteforms. Unfortunately, the application of new advances in molecular characterization to radiochemistry, particularly in the area of evaluating the importance of interfacial processes, has lagged behind other areas of environmental science due the need for dedicated equipment and facilities for such studies, and the fundamental difficulties of observing molecular level processes for radionuclides that are often present in very minor amounts in the interfacial region of bulk wastes or geologic materials.

A major objective of EMSL's Radiochemistry Annex is to provide a specialized environment where scientists can apply advanced experimental resources for imaging and spectroscopy to studies of radionuclides in environmental samples and waste forms. The user facility consists of approximately 6000 sq ft of lab space for NMR, EPR, XPS spectroscopies and AFM, EMP, FIB/SEM, SEM, and TEM imaging. Together with NWChem, EMSL's premier computational modelling code, users are able to address radionuclide systems from both experimental and computational vantage points. An overview of research projects and science areas ideally suited to the capability will be provided as well as modes of user access.