
Expanding the University of Notre Dame’s Nuclear Research Capabilities to Include Mass Spectrometry for Samples Containing Transuranic Materials

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ABSTRACT:

The project titled “Expanding the University of Notre Dame’s Nuclear Research Capabilities to Include Mass Spectrometry for Samples Containing Transuranic Materials” seeks to provide a new avenue for research and student training in the nuclear field. The award will provide the ability to purchase a gas chromatograph mass spectrometer (GC-MS) with a pyrolysis furnace sample introduction system that will allow for the characterization of liquid, gas, and solid samples containing transuranic material. Funds will also be used to design and construct two customized enclosures to house the GC-MS and an electrospray ionization mass spectrometer which will provide the containment necessary to safely analyze transuranic samples. The team at the University of Notre Dame includes a group of interdisciplinary researchers across campus. The initial research projects that will benefit from the addition of MS techniques focus on nuclear waste separations, the fate and transport of radionuclides in the environment, and actinide materials development. Nuclear waste separations projects include the characterization of degradation products of small organic and actinide complexes after irradiation, radiolytic breakdown products of ion-exchange resins, and fingerprinting Pu oxide nanoclusters in solution. MS techniques will be used to identify breakdown products in systems containing radionuclides and small organic molecules relevant to environmental systems. Gas products formed during the development of actinide materials using solution combustion synthesis will also be investigated. The expansion of the University of Notre Dame’s research capabilities will increase opportunities for students to gain valuable experience in techniques related to the nuclear fuel cycle.