



Contribution ID: 38

Type: Oral Communications

ORAL PRESENTATION - Curriculum Development for Nuclear Fuel Chemistry, Reprocessing and Separation Chemistry, and Radioactive Waste Management at the Pennsylvania State University

Thursday 20 September 2012 15:20 (15 minutes)

Recent curriculum development in the Department of Mechanical and Nuclear Engineering at Penn State University includes Laboratory Experiments in Applied Nuclear and Radiochemistry and a new Nuclear Security Education Program (NSEP) being developed in collaboration with MIT and TAMU with the support of the DOE-NNSA, Global Threat Reduction Initiatives. To supplement the NSEP and attract more undergraduate students in radiochemistry, development of several new course modules has been started at Penn State with US Nuclear Regulatory Commission funding. The course modules are structured in two tiers, introductory and advanced; students will be required to satisfactorily complete the two introductory modules before enrolling in the advanced modules. The introductory module Introduction to Actinide and Lanthanide Chemistry provides a review of basic nuclear and chemical concepts, as well as more advanced concepts on the electronic structure, aqueous behavior, and solid behavior of the actinide and lanthanide elements. Introduction to the Nuclear Fuel Cycle introduces the most common types of nuclear reactors and the collective process of the nuclear fuel cycle, including fuel harvesting, processing, use, and disposal. Four advanced course modules provide in-depth instruction on specialized areas of the fuel cycle and actinide chemistry. Nuclear Fuel Chemistry presents the chemistry of nuclear fuels in three parts: the characteristics and manufacture of nuclear fuel; alteration processes in nuclear fuel during irradiation; and post-irradiation chemical behaviors of nuclear fuel under storage or disposal conditions. Nuclear Fuel Reprocessing and Separations Chemistry reviews the radionuclide inventories for used commercial fuel bundles of typical burnup levels, as well as the overall objectives and outcomes required of any potential reprocessing method. Detailed studies of the chemistry of several important historical and research-scale reprocessing methods are emphasized. Radioactive Waste Management presents current and potential waste disposal options for all parts of the nuclear fuel cycle. In Environmental Radiochemistry, students are presented with the most important radionuclides of environmental concern and the environmental processes that influence their behavior. Details of the development of radiochemistry course modules at Penn State will be presented.

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Session Classification: Session 11: Education and training in radiochemistry and dissemination of culture in nuclear and radiochemistry (session organized by CINCH consortium)

Track Classification: Education in radiochemistry and dissemination of culture in nuclear and radiochemistry