Contribution ID: **288** Type: **oral**

On-Line Monitoring for Process Control and Safeguarding of Radiochemical Streams at Spent Fuel Reprocessing Plants

Tuesday, 21 October 2014 09:10 (20 minutes)

The International Atomic Energy Agency (IAEA) has established international safeguards standards for fissionable material at spent nuclear fuel reprocessing plants to ensure that significant quantities of weapons-grade nuclear material are not diverted from these facilities. Currently, methods to verify material control and accountancy (MC&A) at these facilities require time-consuming and resource-intensive destructive assay (DA). Leveraging new on-line non-destructive assay (NDA) techniques in conjunction with the traditional and highly precise DA methods may provide a more timely, cost-effective and resource-efficient means for MC&A verification at such facilities. Pacific Northwest National Laboratory (PNNL) is developing on-line NDA process monitoring technologies, including a spectroscopy-based monitoring system, to potentially reduce the time and resource burden associated with current techniques. The spectroscopic monitor continuously measures chemical compositions of the process streams including actinide metal ions (U, Pu, Np), selected fission products, and major cold flowsheet chemicals using ultra-violet and visible, near infrared and Raman spectroscopy. This paper will provide an overview of the methods and report our on-going efforts to develop and demonstrate the technologies. Our ability to identify material intentionally diverted from a liquid-liquid solvent extraction contactor system was successfully tested using on-line process monitoring as a means to detect the amount of material diverted. A chemical diversion, and detection of that diversion, from a solvent extraction scheme was demonstrated using a centrifugal contactor system operating with the PUREX flowsheet. A portion of the feed from a counter-current extraction system was diverted while a continuous extraction experiment was underway. The amount observed to be diverted by on-line spectroscopic process monitoring was in excellent agreement with values based from the known mass of sample directly taken (diverted) from system feed solution.

Country or International Organization

United States of America

Primary author: BRYAN, Samuel (Pacific Northwest National Laboratory)

Co-authors: CASELLA, Amanda (Pacific Northwest National Laboratory); LEVITSKAIA, Tatiana (Pacific Northwest National Laboratory)

Presenter: BRYAN, Samuel (Pacific Northwest National Laboratory)

Session Classification: Safeguards for Reprocessing and Pyroprocessing Facilities