Automated analyzer for complex nuclear waste provides rapid results

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Identifying and quantifying specific alpha- and beta-emitting radionuclides in liquid solutions can be challenging and time consuming – typically taking from days to weeks to get results back from an analytical laboratory. But, when an industrial process-scale plant requires that an accurate, reliable analysis be completed in near real-time from samples retrieved directly from the process line, the challenge could be overwhelming.

However, scientists at Pacific Northwest National Laboratory have assembled a robust, fully automated prototype process monitor to meet demanding production needs.

The device developed by PNNL scientists provides microwave-assisted sample pretreatment, flexible chemical separations capabilities, sensitive radiochemical detection, calibration and data analysis. PNNL presenter Matthew J. O'Hara said, "This is the most extreme example of automation ever demonstrated by our team."

The prototype system was originally created to perform rapid radiochemical analysis of technetium-99 in nuclear waste destined for vitrification at the Hanford Site's Waste Treatment Plant in Washington state. Samples can be adjusted, separated and analyzed in less than 15 minutes to provide feedback on process performance.

While developed for specific radionuclides in high-level nuclear waste process streams, the analyzer is capable of being adapted for use on a

wide range of applications requiring an integrated system that performs sample preparation, column separations, on-line detection and data analysis conducted rapidly and autonomously.

PNNL scientists Jay W. Grate and Matthew O'Hara will describe pioneering work in the development of automated radiochemical analysis systems, radionuclide sensors and process monitoring approaches in back-to-back presentations at the 233rd American Chemical Society Meeting in Chicago.

Source: Pacific Northwest National Laboratory