Scientists Develop Method to Remove Uranium from Contaminated Steel Surfaces

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Scientists from the U.S. Department of Energy's Brookhaven National Laboratory, Center for Environmental and Molecular Sciences, and Stony Brook University (SBU) have developed a simple, safe method of removing uranium from contaminated metallic surfaces using citric acid formulations so that the materials can be recycled or disposed of as low-level radioactive or nonradioactive waste. The research is published in the July 1, 2005 issue of *Environmental Science and Technology*.

Decontamination of radionuclides from metallic and other surfaces contaminated by radiological incidents is a major environmental challenge. Brookhaven scientist A.J. Francis, assisted at the Lab by Cleveland Dodge and by Gary Halada at SBU, led the effort in developing an innovative and improved process for decontaminating metal surfaces and other materials. The research team developed an environmentally friendly green-chemistry process that uses all naturally occurring materials – citric acid, common soil bacteria, and sunlight. Present methods of removing uranium from contaminated metal surfaces include sand blasting, chemical extraction, and electro-chemical dissolution. These methods generate secondary waste streams, creating additional disposal problems.

"In the event of a radiological incident, such as a 'dirty bomb,' this technology can be used to clean up contaminated materials," Francis said. "It will also treat the secondary waste generated from the treatment process, resulting in waste minimization. It is a comprehensive process."

Using the National Synchrotron Light Source, a source of intense x-rays, ultraviolet and infrared light at Brookhaven Lab, the researchers systematically examined the contaminated materials at the molecular scale and the association of uranium before and after treatment with citric acid formulations. The efficiency of uranium removal ranged from 68 percent to 94 percent, depending on the age and extent of corrosion.

Wastewater generated from the decontamination process was subjected to biodegradation followed by photodegradation, which minimized the generation of secondary waste and allowed the uranium to be recovered. This process, which has been patented, can also be used to remove toxic metals and radionuclides from contaminated soils, wastes, and incinerator ash.

The research was funded by the Environmental Management Science Program of the Environmental Remediation Sciences Division, Office of Biological and Environmental Research of the Department of Energy's (DOE) Office of Science. DOE's Environmental Management Science Program supports basic research to clean up DOE legacy sites and the technologies that have emerged from the program can also be used in response to radiological incidents.

Source: BNL