

# Nuclear waste might be a thing of the past

April 2 2018, by Chrystian Tejedor

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Matthew Fortunato gathers chemicals needed for research into removing actinides – the most dangerous, long-lived radioactive elements – and mercury from used radioactive fuel. Credit: Florida International University

Matthew Fortunato starts his days mixing chemicals in radiochemistry professor Konstantinos Kavallieratos' lab. It is a task he knows well. With a practiced hand, he collects just the right amount of powders and liquids and blends them together in a flask. He is not distracted by the

intense, fishy smell or the bubbling of the liquid. He is focused. His movements are quick and precise.

By the time the mixture has been warmed and blended, it has taken on a thick, yellow appearance. Making this broth is the first step Fortunato must take on his journey to finding the right mix of ingredients that could rid nuclear waste of actinides – the most dangerous long-lived radioactive elements – and toxic mercury.

During the Cold War, the U.S. Department of Energy produced tons of [nuclear material](#) for the development of the nation's nuclear weapons stockpile. Today, the United States is awash in radioactive material from weapons production and some from [nuclear power plants](#) that could take 100,000 years to go away – unless Kavallieratos and students like Fortunato can find the molecule that could render the waste safer and reusable.

In the lab, Fortunato is hoping to build on his successes in making more of these molecules for testing. He has been able to boost production of the molecule from a 10 percent yield to a 40 percent yield. He has been able to turn it into a crystal – a key step in understanding its shape and ability to bind to those more harmful elements of [nuclear waste](#).



Matthew Fortunato Credit: Florida International University

"This feels interesting and useful. If this works, it can be a good way to us step away from fossil fuels," Fortunato said. "It was something completely different than what I had ever done in a lab for class."

As an undergraduate, lab sessions were mostly about helping Fortunato understand the topics covered during a lecture. Hungry to learn more about chemistry, he pursued an internship with the Miami-Dade County Medical Examiner's toxicology lab where he dutifully shadowed the analysis of the samples on complicated instruments. A conversation with Kavallieratos and a curiosity about making nuclear energy safer and reusable exposed Fortunato to a whole new world of research and Energy Department scholarships that helped make earning his degree

more affordable.

"Usually you hear about chemists becoming pharmacists or going into forensics," Fortunato said. "I never thought about the aspect of a career that you work toward solving a problem or the scientists who work in national labs."

One day, Fortunato might join their ranks. For now, he's learning what it takes to get there – measuring, mixing, analyzing and hopefully solving one of the country's biggest problems as a newly minted assistant in Kavallieratos' lab.

Provided by Florida International University

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