Sandia National Laboratories
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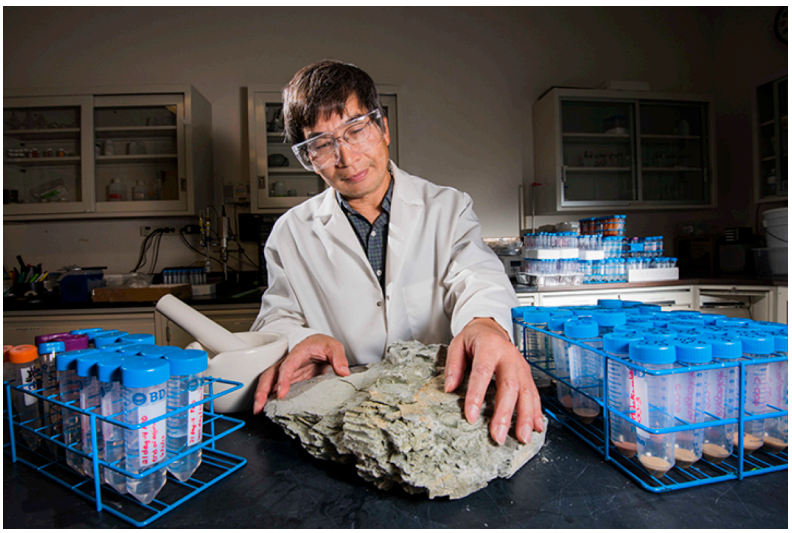
Study Could Help Improve Nuclear Waste Repositories

How fast will iodine-129 released from spent nuclear fuel move through a deep, clay-based geological repository? Understanding that process is crucial as countries worldwide consider underground clay formations for nuclear waste disposal, because clay offers low permeability and high radionuclide retention. Even when a repository isn't sited in clay, engineered barriers often include a compacted buffer of bentonite, a common type of clay, to improve waste isolation.



Sandia researcher Yifeng Wang examines a clay sample from South Dakota as part of iodide experiments. A team of Sandia researchers is working to understand how fast iodine-129 released from spent nuclear fuel would move through a deep clay-based geological repository. (Photo by Randy Montoya)

Iodine-129, a radioactive isotope with a half-life of 15.7 million years, is a major contributor to a deep geological repository's predicted total radiation dose. Even a small improvement in clay's ability to retain iodine-129 can make a difference in total dose predictions. Some evidence indicates weak interaction between clay and iodide—a negatively charged predominant chemical species of iodine in geologic repositories, said researcher Yifeng Wang (Radiological Consequence Management and Response Technologies Dept.), who leads the LDRD project (now in its third year).

Computer models haven't been able to adequately explain clay's chemical behavior with iodide, and the mechanism is difficult to study because the faint interaction is easily masked by measurement uncertainties. "It seems there's some kind of previously unrecognized mechanism that accounts for that kind of interaction," said Wang. His team concluded the interaction, often disregarded as experimental noise, is real and that there might be engineering ways to improve clay's ability to retain iodide.

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