MARKET SHEET

Inherently Safe In-Situ Uranium Recovery

Sandia National Laboratories

An in-situ method of extracting uranium that significantly reduces adverse impacts to communities and water sources

US Patent 8,708,422

Technology Readiness Level 2-3

There remains a growing unmet need for domestic sourcing of uranium in the United States as well as continued concerns over its environmental impact. In-situ recovery (ISR) uses fluids containing chemical agents to dissolve uranium ore in a subsurface mine. Uranium can be recovered after the fluid is pumped back up to the surface; however, this process involves circulating reactive fluids through an underground uranium deposit, which leaves behind pollutants and traditionally hazardous waste.

The technology and methods developed by researchers at Sandia National Laboratories have four pieces that integrate a green "leaching" process that immobilizes uranium and other trace metals, a backup decontamination process, optimized well-field designs that increases uranium recovery efficiency while reducing contaminated water, and a protocol for long-term monitoring. The process is effective and environmentally friendly because land surfaces are not degraded by mining or ore milling operations. For example, researchers have been able to artificially stimulate sulfate-reducing bacteria to feed on indigenous sulfate in groundwater and provide needed sulfide to re-precipitate formation minerals. In addition, the mobility of pollutants can be tied to artificial oxidizing conditions imposed on the underground aquifer by ISR activity. Unlike current technologies, Sandia's set of novel techniques re-imposes reducing conditions on the aquifer once the mining

Shown above: Sandia researcher, James L. Krumhansl Ph.D., lead developer for green method to mine uranium.

MARKET SHEET

Inherently Safe In-Situ Uranium Recovery

process is complete. The process includes introducing organic agents targeted to complexing tetravalent uranium, rather than traditional hexavalent uranium. This innovative solution can restore the aquifer to a suitable condition, providing regulatory bodies greater peace of mind when signing off on final site closure plans.

Next Steps

Sandia is seeking partners to develop and commercialize Inherently Safe In-Situ Uranium Recovery. To learn more, contact Sandia National Laboratories' Licensing and Technology Transfer office.

Technical Benefits

- Increased safety of uranium removal
- Environmentally friendly process
- Restoration of aquifer to regulatory standards
- Reduced cost of mineral recovery
- Greater efficiency
- Increased waste removal efficiency and effectiveness
- Reliable and predictable remediation
- Affinity for tetravalent uranium

Industries & Applications

- Nuclear power & waste applications
- Mining operations
- Climate and environment sciences
- Infrastructure security

Contact Us SD# 11506

ip@sandia.gov ip.sandia.gov

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA-0003525.

SAND 2022-15858 M