

The Prospect of Using Advanced HALEU & TRISO Fuels in Advanced Nuclear Reactors

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New types of nuclear reactors are pushing the limits of what fuels need to deliver in terms of safety, efficiency, and long-term performance. This report looks closely at two important fuels that are leading the way: High-Assay Low-Enriched Uranium (HALEU) and Tristructural-Isotropic (TRISO) fuel. HALEU, with uranium-235 enrichment levels between 5% and 20%, makes it possible to build smaller, longer-lasting reactor cores and improves neutron economy. These features are especially useful for small modular reactors, microreactors, and fast reactors. TRISO fuel, built with multilayer coatings around uranium kernels, is known for keeping fission products trapped even under very high temperatures, sometimes reaching over 1600°C. This makes it a strong candidate for high-temperature gas-cooled reactors and systems that focus on accident tolerance. While a lot of progress has been made, the studies also point to some challenges, like gaps in the HALEU supply chain and the difficulty of making TRISO fuel at scale. Fixing these problems with more investment, smarter regulations, and new innovations will be key to making sure these fuels help nuclear energy stay strong and sustainable in the future.

Technical Track

Nuclear Materials

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