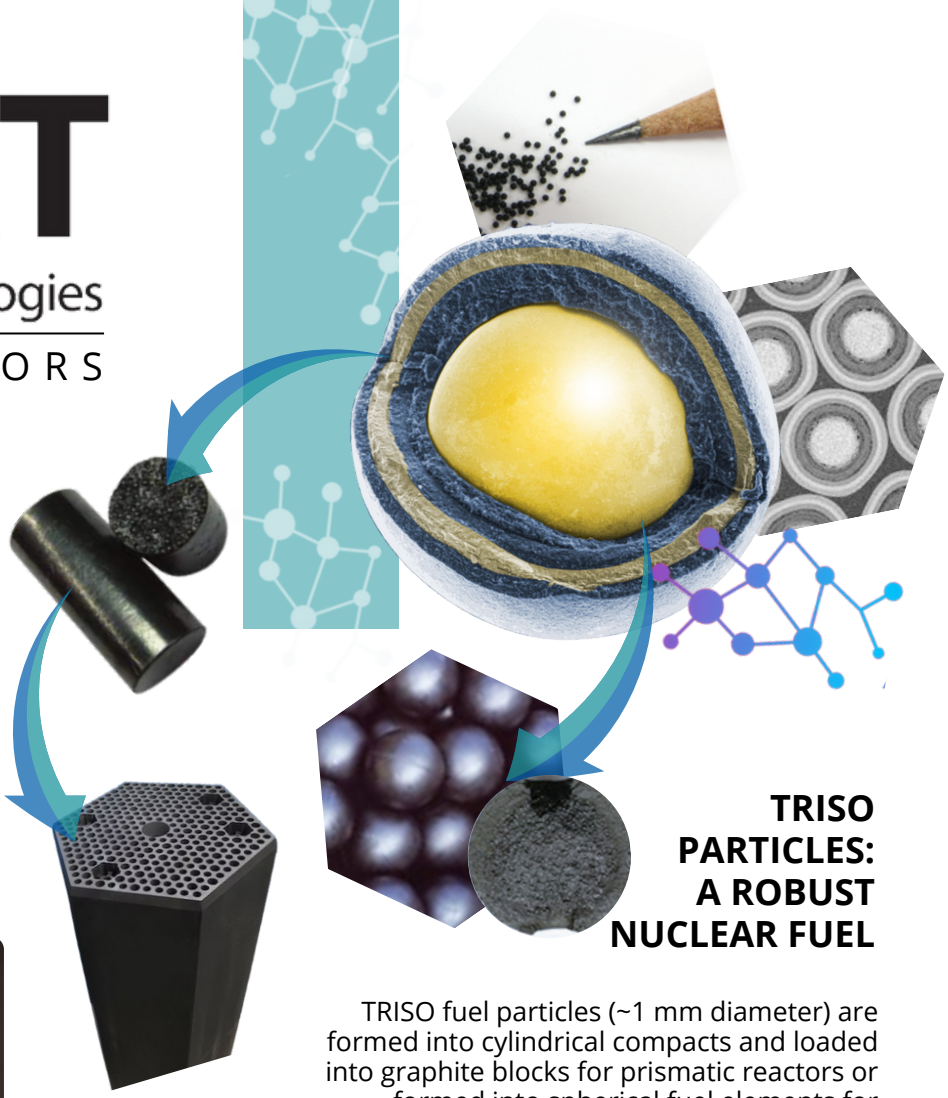
ART

Advanced Reactor Technologies

GAS-COOLED REACTORS

The mission of the Department of Energy Nuclear Energy's (DOE-NE) Advanced Reactor Technologies (ART) program is to develop new and advanced reactor designs and technologies that strengthen reactor competitiveness and support the nation's energy, environmental, and national security needs.

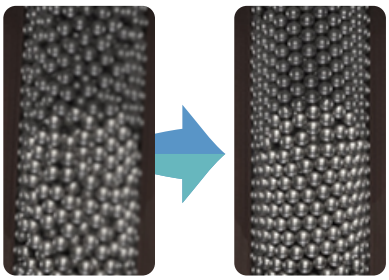
ART is primarily performed at the Idaho, Argonne, and Oak Ridge national laboratories and includes participants from industry and universities. The program also participates in international collaborations to foster and leverage international reactor, technology, research and development.



TRISO PARTICLES: A ROBUST NUCLEAR FUEL

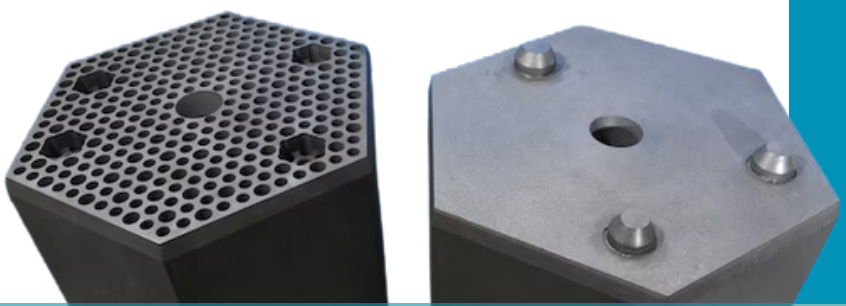
TRISO fuel particles (~1 mm diameter) are formed into cylindrical compacts and loaded into graphite blocks for prismatic reactors or formed into spherical fuel elements for pebble be reactors.

PEBBLE BED SETTLING



With increased computational resources, it is now possible to perform high-fidelity full-core simulation of pebble movements using Discrete Element Methods (DEM). Initially, the pebble bed packing of fuel spheres is random, with very few organized structures (*left*).

As fuel cycling progresses (*right*), a crystallization phenomenon occurs whereby groups of pebbles form orderly lattices as they settle. This is partly responsible for the bed porosity decrease over time, and can influence the local power peaking during the pebble bed start-up phase.



ATR GAS COOLED REACTOR (GCR) PROGRAM INTEGRATES THESE MAJOR ELEMENTS:

Fuel development and qualification: fabrication, irradiation, and characterization of advanced (UCO) tri-structural isotropic (TRISO) particle fuel.

Graphite research and qualification: selection, irradiation, and characterization of existing nuclear graphite grades.

Advanced Materials: American Society of Mechanical Engineers (ASME) codification of alloys and design methods development for high temperature duty.

High temperature Gas-cooled Reactor (HTGR) Methods: core analysis methods development and experimental validation, code-to-code benchmarks and uncertainty analyses.

Want to learn more?

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