Pacific Northwest
NATIONAL LABORATORY

CINEMa
Center for Innovation of Nuclear Energy Materials
@PNNL

ACCELERATING DEPLOYMENT *of* NEW NUCLEAR ENERGY MATERIALS

PNNL's in-depth expertise is advancing solutions to materials challenges in extreme environments

RESPONDING TO NEEDS ACROSS THE REACTOR LIFE CYCLE

The Center for Innovation of Nuclear Energy Materials (CINEMa) connects the multidisciplinary materials capabilities at Pacific Northwest National Laboratory (PNNL) with industry, universities, and research sponsors to accelerate the deployment of advanced nuclear energy systems. With in-depth expertise across multiple research mission spaces, PNNL assists in the development, qualification, and deployment of advanced nuclear energy materials and their innovative manufacturing processes.

Materials are a vexing challenge for the existing fleet of nuclear power plants and for the future deployment of advanced reactors.

- Materials issues affect operations for all new types of reactors—both fission and fusion—and are instrumental to sustaining light-water reactors
- Challenges exist across the entire reactor life cycle, from the barriers to identifying new materials to detecting and preventing the degradation of components during operation
- The process to introduce new materials takes a long time, which can increase costs and limit innovation



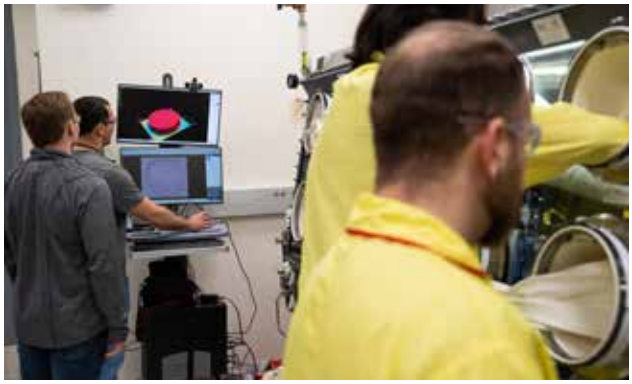




Top: *Receiving used fuel rods in the Radiochemical Processing Laboratory.* ***Middle:*** *Puncturing a used fuel rod to measure gas, capture isotopes, then test the cladding.* ***Bottom:*** *Mechanical property testing in a hot cell.*









Top to bottom: *Microstructural characterization; ShAPE™ fabrication; plutonium handling (metal or mixed oxide fuel); mechanical testing.*

CINEMa supports the nuclear energy industry in efficiently and rapidly deploying materials that enhance both safety and economic performance while meeting the stringent demands of the industry, reducing the nation's reliance on internationally sourced critical materials, and increasing overall efficiency.

MULTIDISCIPLINARY CAPABILITIES EMPOWER IMPACTFUL RESEARCH

CINEMa responds efficiently to the nation's needs for nuclear energy material development, fabrication, characterization, and examination by connecting well-established capabilities and expertise at PNNL—leading to impactful research and development for advanced nuclear energy materials. All structures, systems, and components—from the reactor pressure vessels to the reactor core and primary systems (such as steam generator tubes), concrete, cables, fuel, and cladding—need new designs and materials for improved tolerance in these extreme environments.

PNNL's capabilities include:

- Post-irradiation examination for improved reactor fuel and structural materials
- Integrated materials design and fabrication processes, including PNNL's innovative Shear Assisted Processing and Extrusion (ShAPE™) technique, to manufacture fuel and structural materials capable of resisting radiation damage, erosion, and thermal shock
- Microscale modeling, mechanical testing, microscopy, computational tools, and stress-corrosion-cracking characterization methods—from the atomic- to engineering-scale—to accelerate qualification of materials.

Contact:



Andy Casella
Director
(509) 375-5110
andrew.casella@pnnl.gov