Pacific Northwest
NATIONAL LABORATORY

NUCLEAR SCIENCES DIVISION

Providing solutions to some of the world's most complex environmental and radiological challenges

CAPABILITIES

- Advanced modeling and simulation for next-generation nuclear fuels and reactors
- Irradiation and metrology to determine human exposure and instrument performance
- Demonstration and optimization of technologies to safely retrieve and process legacy nuclear waste
- Accelerated materials aging and analysis to detect and prevent degradation
- Radiological and nuclear detection to address proliferation and elicit transport
- Post-irradiation examination and mechanical analysis of nuclear fuels and structural components
- Materials science to understand and improve materials behavior in extreme environments
- Spent fuel recycling for proliferation-resistant processing and advanced disposal options

EXCEPTIONAL PEOPLE • STAKEHOLDER FOCUSED • TRUSTED PERFORMANCE

MISSION

Through experimentation and modeling of nuclear materials behavior and processing, we enable our nation's energy independence, remediate legacy nuclear waste, and prevent acts of terrorism by providing innovative solutions to the U.S. government and industry.

WHO WE ARE

At a time when complex energy, environmental, and national security problems are emerging on every front, the Nuclear Sciences Division leverages the broad expertise of more than 250 staff to provide solutions. Our deep capabilities are complemented by state-of-the-art research facilities and strong partnerships. Pacific Northwest National Laboratory is committed to delivering science and technology innovations to support the nation's nuclear mission.

Our diverse work addresses a wide range of national and international challenges, from protecting the health of people who must work in hazardous environments, to developing durable new materials, streamlining industrial processes for improved productivity and effectiveness, and delivering new approaches for environmental cleanup.

Our scientists and engineers are developing and improving the performance of wasteforms like glass and grout, solving chemistry and processing challenges for waste stored in underground tanks at the U.S. Department of Energy's Hanford and Savannah River sites, and assuring the integrity of materials used in the extreme environments of nuclear power reactors.

WE ENCOURAGE BOLD NEW IDEAS AND BUILD ENDURING CAREERS

Exceptional People

We provide the tools that enable exceptional people to accomplish extraordinary things in a collaborative research environment. Our people are our most valuable asset.

Stakeholder Focused

We seek to accelerate the research discovery, development, and deployment cycle by engaging prospective end-users early in the process. Through close collaboration with industry partners and other stakeholders, we develop a real-world understanding of what success must look like.

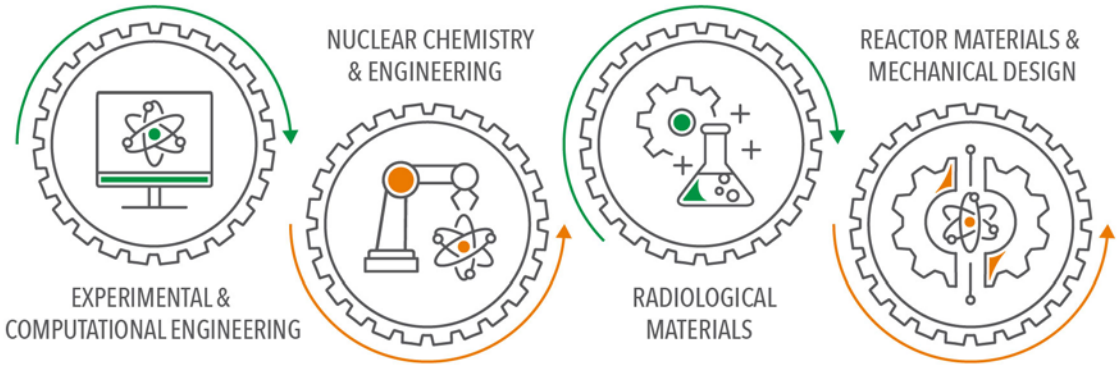
Trusted Performance

Our goal is to exceed our stakeholder's expectations 100 percent of the time.

FACILITIES

- Radiochemical Processing Laboratory
- Materials Science and Technology Building
- Radiological Exposures and Metrology Laboratory
- Wasteform Development Laboratory
- Radiological Microscopy Suite
- Reactor Component Test Facility

TECHNICAL GROUPS



- Multi-Phase Fluids
- Simulant Development
- Structural Analysis
- Safety Analysis

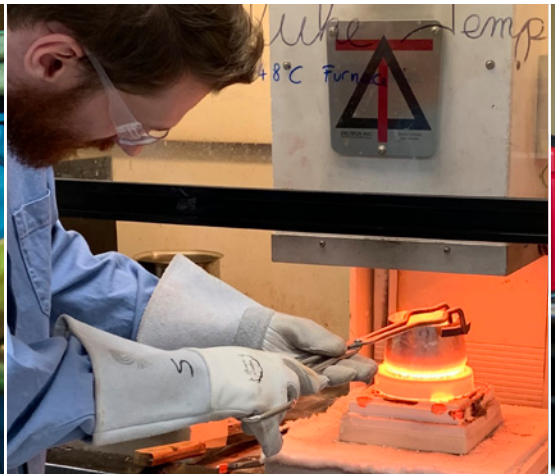
- Separations
- Radiochemistry
- Actinide Sciences
- Radiation Dynamics, Effects, and Dosimetry
- On-line Monitoring

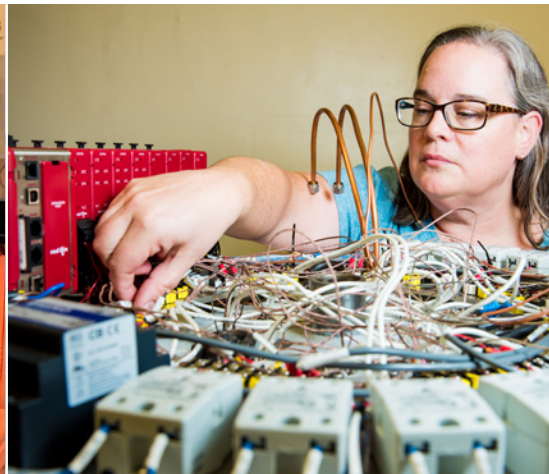
- Advanced Wasteform Development
- Molten Salt Reactor Chemistry
- Process Engineering and Development
- Off-Gas Capture and Immobilization

- Modeling & Data Analytics
- Mechanical Design
- Materials Characterization
- Stress Corrosion Cracking

Our **Experimental and Computational Engineering** group explores and delivers engineered solutions based on multi-disciplinary expert analysis, experimentation, and computation. Our science and engineering capabilities address challenges involving multi-phase fluid dynamics, structural and safety analysis, heat transport, nuclear radiation modeling, and reactive transport from small- to full-scale. Modeling expertise in finite element analysis and computational fluid dynamics, combined with advanced manufacturing techniques, help us rapidly explore engineering solutions to real-world challenges for government, commercial, and regulatory entities within the nuclear power, nuclear waste treatment, radioactive material packaging, and alternative energy industries.

Our **Nuclear Chemistry and Engineering** group supports legacy waste cleanup, the beneficial use of nuclear materials, the nuclear fuel cycle, national security, and nuclear energy production. Through fundamental radiochemical science and strong academic collaborations, we are fostering a renewed national focus on radiochemistry and irradiated materials research in several areas, including nuclear nonproliferation, environmental cleanup, advanced nuclear energy, and the beneficial use of isotopes for medicine and industry. Our technical capabilities include radiochemical process engineering, irradiated materials characterization, dosimetry and radiation effects, and radiochemical separations and conversions. This includes a comprehensive suite of analytical instrumentation supporting research in process modeling, online monitoring, colloidal dispersion science, and surface science. We maintain stewardship for the Radiochemical Processing Laboratory, one of the few remaining multipurpose Hazard Category II nuclear facilities in the U.S. Department of Energy complex focused on research and development, with remote hot cells and radiological glove boxes that, among other wide-ranging research activities, support spent fuel receipt and post-irradiation examination. In addition, we steward calibrated neutron and gamma irradiation capabilities.



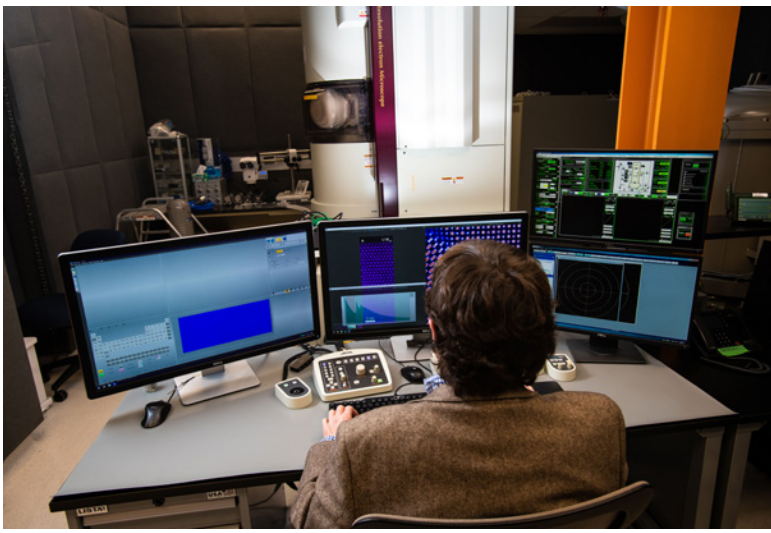


Our **Radiological Materials** group integrates engineering and materials science to develop and demonstrate novel materials and innovative processes. We aim to increase the nation's energy independence by supporting the nuclear energy sector, to protect human health and the environment from legacy waste, and to secure the nation's nuclear stockpile. Our work includes advanced wasteform development, waste vitrification, glass and materials science, cementitious material development, process engineering, as well as off-gas capture and immobilization in support of the nuclear fuel cycle. We have a special focus on molten salt reactor chemistry promoting scientific and management strategies for Gen IV molten salt reactor systems.

Our **Reactor Materials and Mechanical Design** group advances fundamental materials science and provides the scientific basis for fission and fusion reactor materials development, light water reactor life extension, safe storage of spent fuel, radiation detection, and design of materials and systems for extreme operating conditions. We specialize in stress corrosion cracking, post-irradiation examination, non-destructive examination, materials characterization through electron microscopy, computational materials science and data analytics, and design of electro-mechanical hardware. Our group has more than 40 highly qualified and experienced staff, including internationally recognized scientists and fellows of professional societies.

ABOUT PNNL

Pacific Northwest National Laboratory draws on signature capabilities in chemistry, Earth sciences, and data analytics to advance scientific discovery and create solutions to the nation's toughest challenges in energy resiliency and national security. Founded in 1965, PNNL is operated by Battelle for the U.S. Department of Energy's Office of Science. DOE's Office of Science is the single largest supporter of basic research in the physical sciences in the United States and is working to address some of the most pressing challenges of our time.



CAREERS

The Nuclear Sciences Division actively seeks candidates with expertise in disciplines including chemistry, radiochemistry, radiation chemistry, materials science, nuclear engineering, computational sciences, applied artificial intelligence, and machine learning.

View PNNL job listings at:
https://www.pnnl.gov/careers

CONTACTS

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