High Flux Isotope Reactor

Driving real-world impacts through science discovery

The High Flux Isotope Reactor (HFIR) is the most powerful reactor-based source of neutrons in the United States, and it provides one of the highest steady-state neutron fluxes of any research reactor in the world.

The neutrons produced at HFIR are used to gain insights on the structure and dynamics of condensed matter, leading to advancements in materials science, biology, chemistry, and physics. Scientists also use this facility to develop isotopes crucial to medicine, global security, energy, and industry. Additionally, HFIR is used for research on severe neutron damage to materials and neutron activation analysis to examine trace elements.

The discoveries made possible by neutrons at HFIR are helping us better understand materials that benefit our daily lives and develop innovative solutions for some of the biggest challenges of the 21st century.

OAK RIDGE National Laboratory | HIGH FLUX ISOTOPE REACTOR

Managed by UT-Battelle LLC for the US Department of Energy

Here's how HFIR is making real-world impacts

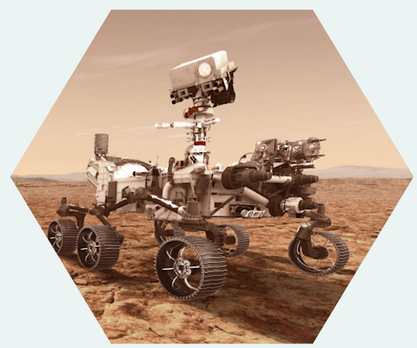
Renewable energy: With the help of neutron experiments at HFIR, scientists discovered a way to slow phonons, which could improve how some types of solar cells convert sunlight to electricity. The findings could pave the way for boosting the efficiency of next-generation solar cells.

Cancer therapy: Actinium-227, a medical radioisotope, is essential for developing Xofigo, Bayer's FDA-approved treatment for metastasized prostate cancer, which has shown a 30% reduction in the risk of death in patients. As the only near-term production site for actinium-227, HFIR is helping ensure that patients have a reliable supply of this drug.

Better batteries: Using neutron imaging techniques at HFIR, scientists probed lithium-ion batteries to track lithium movement in battery electrodes. Understanding this process could help experts design safer batteries with faster recharge rates.

Public safety: HFIR is the only facility in North America that produces nickel-63, a radioisotope used for detecting explosives, narcotics, and hazardous chemicals. Using detectors that contain this isotope, airport security officers can screen for dangerous materials that would threaten public safety.

Advanced materials: HFIR neutrons were used to evaluate dental implant biomaterials and examine how they interact with natural tooth structures. The data will help researchers develop restorative dental materials that last longer and, therefore, are less costly for patients in the long run.



Space exploration: HFIR serves as the nation's only source of new plutonium-238, a radioisotope used to fuel NASA's deep space missions. NASA's Mars Perseverance rover is powered by HFIR-produced plutonium-238 as it searches for signs of ancient life across the planet's surface.

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