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News

Nuclear—Follow your senses

Topic: Nuclear Science and Technology

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Oak Ridge National Laboratory is using ultrasonic additive manufacturing to embed highly accurate fiber optic sensors in heat- and radiation-resistant materials, allowing for real-time monitoring that could lead to greater insights and safer reactors. Nuclear reactors are highly instrumented to monitor such variables as temperature and pressure, but no currently available sensor can monitor a reactor component's structural health during operation when exposed to extreme temperatures and radiation. With additive manufacturing, the highly accurate, radiation-hard sensors are embedded in structures or components. "Fiber optic sensors are unique because they provide spatially distributed measurements, showing what's happening across the entire system, not just a single point," said ORNL's Chris Petrie. "For advanced reactors, you could embed these sensors in locations where it would otherwise be impossible to detect the location and premature nature of component failures." Researchers have tested the process by embedding sensors in nickel-based alloys and heating them to 500 degrees Celsius.



ORNL nuclear engineer Chris Petrie has led the research into using ultrasonic additive manufacturing to embed fiber optic sensors for nuclear applications. The development could embed sensors in advanced reactor components or structures, providing greater insights into how the reactors operate. Credit: Carlos Jones/Oak Ridge National Laboratory, U.S. Dept. of Energy

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