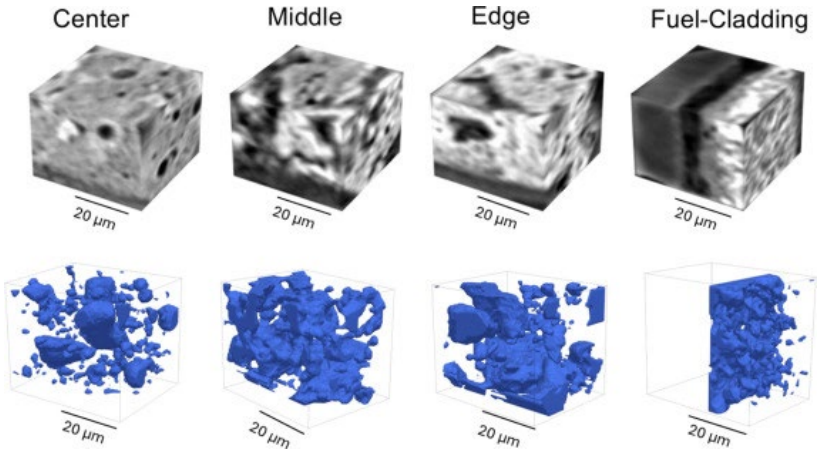
# Pore Structure Influences Nuclear Fuel Performance




*3D reconstructed microstructure (top row) and segmented porosity (bottom row) from X-ray tomography of U-10Zr fuel samples at increasing radial distances: Center, Middle, Edge, and Fuel-Cladding interface. Segmented pore volumes (blue) reveal larger, more interconnected porosity moving away from the center, towards the edge and cladding.*

A. A. Harrup, R. Moeykens, M. Drakopoulos, N. T. Vo, J. Howard, C. B. Jensen, T. Yao, and E. Jossou, "Site specific porosity-thermal performance correlations in neutron irradiated U-10Zr fuel," *Materials Today* **97**, 103349 (2026).
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## Scientific Achievement

Scientists demonstrate that the performance of irradiated metallic nuclear fuel is not just influenced by the number of pores it has, but the size, shape, orientation, and connectivity of those pores.

## Significance and Impact

Understanding how these features affect heat transport, fission gas release, element transport, and long-term degradation can help guide the design of longer-lasting metallic fuels.

## Research Details

- X-ray computed tomography at the HEX beamline provided non-destructive analysis of how pores, elements, and chemical reactions change throughout a U-10Zr fuel sample.
- Moving outward, from the center of the irradiated fuel, pores become larger, more numerous, and more interconnected.
- Interconnected pores allow gases and radioactive elements to move more easily, accelerating degradation.

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