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Characterization of Nuclear Fuels by Energy-Resolved Neutron Imaging and Neutron Diffraction[1] ADRIAN LOSKO, SVEN VOGEL, Los Alamos National Laboratory, ANTON TREMSIN, University of California at Berkeley, MARK BOURKE, STEWART VOIT, KEN MCCLELLAN, Los Alamos National Laboratory, HEINZ NAKOTTE, New Mexico State University — The unique advantages of neutrons for characterization of nuclear fuel materials are applied to accelerate the development and ultimately licensing of new nuclear fuel forms. Energy-resolved neutron imaging and tomography allows visualizing cracks, arrangement of fuel pellets in rodlets etc., but also characterization of isotope or element densities by means of neutron absorption resonance analysis. Complementary diffraction measurements allow characterization of the crystallography of phases consisting of heavy elements (e.g. uranium) and light elements (e.g. oxygen, nitrogen, or silicon). The penetration ability in combination with comparably large (e.g. cm sized) beam spots provide microstructural characterization of typical fuel geometries for phase composition, strains, and textures from neutron diffraction. In this presentation, we provide an overview of our recent accomplishments in fuel characterization for accident-tolerant fuels consisting of uranium nitride/uranium silicide composite fuels.

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