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Imaging at the Spallation Neutron Source: Opportunities and Challenges

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Over the past few years, several wavelength-dependent neutron imaging capabilities have been developed at spallation neutron sources such as RADEN at J-PARC and IMAT at ISIS. At the Spallation Neutron Source of Oak Ridge National Laboratory, wavelength-dependent experiments are ongoing, and a temporary imaging capability is being planned at the Spallation Neutrons and Pressure Diffractometer (SNAP), beamline 3) instrument. A design of this new imaging capability is presented. The facility will be equipped with exchangeable apertures optimized for cold, thermal and epithermal neutrons, respectively. A dedicated sample area (for 2D and 3D data acquisition) and in-house event mode microchannel plate (MCP) detector are currently being developed as part of this project.

Recently, the team has measured crystalline structures (using cold neutrons) and isotopic content (using epithermal neutrons) in superalloys and nuclear fuel material, respectively. We present the characterization of additively manufactured (AM) Inconel 718 using wavelength-dependent radiography, the so-called Bragg edge imaging technique, diffraction and modeling. This dual-modality capability combined with modeling provides unique information about the crystalline

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