

A Fusion Materials Irradiation Test Station at the Spallation Neutron Source

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It has long been recognized by the nuclear materials research community that facilities suitable for irradiation studies relevant to envisioned fusion power systems are lacking. Therefore, efforts are underway at the Spallation Neutron Source (SNS) to design an irradiation facility at the beam entrance region of the SNS target module for materials science research in support of fusion energy technologies. The unique mixed spectrum of high-energy protons and spallation neutrons at the SNS permits exposure to several different irradiation parameters of interest to the fusion materials community. For example, since the He production rate is heavily dependent on the proton fluence, the He production rates can be customized for each experiment; with He gas production to displacement ratios ranging from 13-75 appm He/dpa for steel and 30-98 appm He/dpa for SiC. The current design of the Fusion Materials Irradiation Test Station (FMITS) consists of two specimen-containing tubes along the front of the SNS target module located above and below the vertical mid-plane. Each specimen tube contains an inner tube surrounded by a water-cooled jacket and an inner tube that is cooled by flowing mixed inert gases, which are used to establish and maintain the target irradiation temperature. Thermal analysis indicate maximum specimen temperatures ranging from 650°C to 1300°C could be achieved using the mixed-gas temperature control system. This poster describes some of the basic features of the FMITS irradiation assembly, including hardware configuration and achievable irradiation parameters.

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