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Tritium Retention and Permeation in Ion- and Neutron-Irradiated Tungsten under US-Japan PHENIX Collaboration[1] MASASHI SHIMADA, CHASE N. TAYLOR, Idaho National Laboratory, ROBERT D. KOLASINSKI, DEAN A. BUCHENAUER, Sandia National Laboratories-Livermore, TAKUMI CHIKADA, YASUHISA OYA, Shizuoka University, YUJI HATANO, University of Toyama — A critical challenge for long-term operation of ITER and beyond to a FNSF, a DEMO and future fusion reactor will be the development of plasma-facing components (PFCs) that demonstrate erosion resistance to intense heat and neutral/ion particle fluxes under the extreme fusion nuclear environment, while minimizing in-vessel inventories and ex-vessel permeation of tritium. Recent work at Tritium Plasma Experiment demonstrated that tritium diffuses in bulk tungsten at elevated temperatures, and can be trapped in radiation-induced trap site (up to 1 at. % T/W) in tungsten [M. Shimada, et.al., Nucl. Fusion 55 (2015) 013008]. US-Japan PHENIX collaboration (2013–2019) investigates irradiation response on tritium behavior in tungsten, and performs one-of-a-kind neutron-irradiation with Gd thermal neutron shield at High Flux Isotope Reactor, ORNL. This presentation describes the challenge in elucidating tritium behavior in neutron-irradiated PFCs, the PHENIX plans for neutron-irradiation and post irradiation examination, and the recent findings on tritium retention and permeation in 14MeV neutron-irradiated and Fe ion irradiated tungsten.

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