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Investigation of ash removal from fusion reactors via palladium and PdN-layered membranes NATALIE CANNON, California State University, Long Beach, CRISTIAN RUANO-ARENS, Princeton University, SHOTA ABE, Princeton University Department of Chemical and Biological Engineering, SAM COHEN, Princeton Plasma Physics Laboratory, BRUCE KOEL, Princeton University Department of Chemical and Biological Engineering — While the D-3He fuel proposed for some fusion reactors is aneutronic, deuterium (D) ions in the plasma can fuse with each other to produce either tritium (T) or 3He. The T fusion ash must be extracted to avoid energetic neutron production in the plasma. One way of separating the 100-keV T from the 100-eV D is by introducing a high H permeability, usually high-Z, material to prevent energetic fusion ash from re-entering the core plasma. Palladium (Pd) is a strong candidate. Pd has a high H sorption rate and permeability through conversion to a metallic hydride when heated to high temperatures, increasing H diffusion. Under these conditions, surface impurities may dissolve and allow H isotopes to be released equally from the front and back surfaces. Pure Pd would not separate the D from the T. However, introducing a thin (˜0.1 μm) diffusion barrier beneath the surface would suppress the back-streaming of deeply implanted T. We will report data on H permeability in Pd and PdN foils at a temperature range of 300-800 K, focusing on the effects of pressure and temperature to destroy permeation barriers that could separate low energy and higher energy fusion ash, (T).

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