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Simple Catalytic Cell for Restoring He Leak Detector Sensitivity on Vacuum Systems with High D_2 Backgrounds.* J. Busath, and H.K. Chiu, General Atomics, P.O. Box 85608, San Diego, California 92186-5608

The DIII–D National Fusion Facility at General Atomics focuses on plasma physics and fusion energy science. The DIII–D tokamak is a 35 m^3 toroidal vacuum vessel with over 200 ports for diagnostic instrumentation, cryogenics, microwave heating, and four large neutral beam injectors. Maintaining vacuum in the 10^{-8} Torr range is crucial for producing high performance plasma discharges. He leak checking the DIII–D tokamak and the neutral beamlines has historically been difficult. D_2 is used as the fill gas in most plasma discharges. After plasma operations, D_2 out-gassing from the torus walls and internal beamline components can exceed 10^{-4} Torr·l/s. The mass of the D_2 molecule (4.028 amu) is indistinguishable from that of the He atom (4.003 amu) to a standard mass spectrometer leak detector. High levels of D_2 reduce leak detector sensitivity and effectively mask the He trace gas signal rendering normal leak checking techniques ineffective. A simple apparatus was developed at GA to address these problems. It consists of a palladium based catalyst cell and associated valves and piping placed in series with the leak detector. This reduces the D_2 throughput by a factor greater than 10,000, restoring leak detector sensitivity. This paper will briefly discuss the development of the cell, the physical processes involved, the tests performed to quantify and optimize the processes, and the operational results at DIII–D.

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