

**Effect of Impurities on the Performance of a Pd-Ag Diffuser**

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A commercially fabricated palladium-silver diffuser (also known as a permeator) purchased from Johnson-Matthey, Inc. was evaluated for performance characterization testing at the Savannah River National Laboratory (SRNL). Different impurities are often present in the feed streams of Tritium process diffusers, but the effect of these impurities on the diffuser performance is currently unknown. Various impurities (including methane, carbon dioxide, carbon monoxide, and ammonia) were fed into the feed stream of the diffuser at various levels ranging from 0.5% to 10% of the total feed flow rate in order to determine the effect that these impurities have on the permeation of hydrogen through the palladium-silver membrane. The introduction of various impurities into the feed stream of the diffuser had a minimal effect on the overall permeation of hydrogen through the Pd-Ag membrane. Of the four impurities introduced into the feed stream, carbon monoxide (CO) was the only impurity that showed any evidence of causing a reduction in the amount of hydrogen permeating through the Pd-Ag membrane. The hydrogen permeation returned to its baseline level after the CO was removed from the feed stream. There were no lasting effects of the CO exposure on the ability of the membrane to effectively separate hydrogen from the non-hydrogen species in the gas stream under the conditions tested.