

Reduction of highly active tritiated water on magnesium

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Highly active tritiated water is formed in tritium processes by reaction between tritium and oxygen traces. Many tritium processes are moisture sensitive, so this water must be trapped. The utilization of molecular sieve traps upstream sensitive processes avoids any moisture dissemination. Tritiated water is first stored adsorbed on molecular sieve. This kind of storage is preferred because of the high radiological impact of liquid tritiated water. This storage system requires periodic decompression of gases produced by the radioactive decay (³He and self radiolysis gases), and could represent an important tritium inventory immobilization. So, tritium recovery from this water should be of interest.

Recovery of tritium gas from tritiated water stored on molecular sieve can be performed in two steps: desorption of the water trapped under a carrier gas and in line reduction of water vapor on a hot metal bed. Several metals are potential candidate to reduce water into hydrogen, but only iron, magnesium and uranium are commonly used [1]. In the case of iron, reduction is not complete (75 % at 773 K). Reaction of reduction on magnesium or uranium is particularly exothermic and could produce a pyrophoricity reaction. Magnesium has been chosen and the water reduction be studied between 673 K and 903 K.

This paper will present results obtained on the reduction step. Different parameters and reactor designs have been studied. The aim of this step is to obtain reduction yield higher than 99 % for a water vapor flow rate up to 120 std. L/h.

[1] R. SCOTT WILLMS, S. KONISHI, K. OKUNO, Use of magnesium for recovering hydrogen isotopes from tritiated water, Fusion Technology 26 (1994) 659-667