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Device for Reversible Hydrogen Isotope Storage with Aluminum Oxide Ceramic Case

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Abstract : Minimization of tritium diffusion leakage when developing devices handling tritium-containing media is key problems whose solution will at least allow essential enhancement of radiation safety and minimization of diffusion losses of expensive tritium. One of the ways to solve this problem is to use Al_2O_3 high-strength non-porous ceramics as a structural material of the bed body. This alumina ceramics offers high strength characteristics, but its main advantages are low hydrogen permeability (as against the used structural material) and high dielectric properties. The latter enables direct induction heating of an hydride-forming metal without essential heating of the pressure and containment vessel. The use of alumina ceramics and induction heating allows: - essential reduction of tritium extraction time; - several orders reduction of tritium diffusion leakage; - more complete extraction of tritium from metal hydrides due to its higher heating up to melting in the event of final disposal of the device. The paper presents computational and experimental results for the tritium bed designed to absorb 6 liters of tritium. Titanium was used as hydrogen isotope sorbent. Results of hydrogen realize kinetic from hydride-forming metal, strength and cyclic service life tests are reported. Recommendations are also provided for the practical use of the given bed type.

Keywords : aluminum oxide ceramic, hydrogen pressure, hydrogen isotope storage, titanium hydride
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