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Helium release from aged palladium tritide

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In order to measure the helium release accurately, many methods including thermal desorption, P-V-T, mass spectrometric analyses and calorimetric measurements have been used. The article provides competitive measure methods of D-T isotope exchange, thermal desorption and aqua fortis dissolution to study helium release from PdTx. The methods of D-T isotope exchange and aqua fortis dissolution combined with mass spectrum and gas chromatogram analyses are original techniques. The helium release ratio of three aged samples were achieved by these methods. Palladium tritides at the initial tritium/palladium(T/Pd) atomic ratio of 0.65 were prepared by gaseous P-V-T method. Three samples were aged at room temperature for 604,1265 and 2168 days, respectively. The obtained results reveal that palladium tritides have the strong ability to retain ^3He generated in their matrix, and ^3He out gassed can not be obviously observed using D-T substitution and thermal desorption methods. In contrast, the helium release ratio of three samples (i.e., 1.94% of 604 days, 2.87% of 1265 days and 3.34% of 2168 days, respectively), measured by aqua fortis dissolution method, indicate that more than 96.7% of ^3He is held up in Pd and the ^3He release ratio is increasing with aging time.

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