



Contribution ID: 21

Type: **Poster**

Experimental Investigation on Cryogenic Adsorption of Low-concentration Hydrogen from Helium by MS5A

Monday, 17 September 2012 17:30 (1h 30m)

Tritium extraction system (TES) is one of the most important components in the helium cooled solid breeder (HCSB) test blanket modules (TBMs) of ITER. TES will extract various isotopic species of hydrogen by the liquid nitrogen cooled molecular sieve adsorber beds (CMSB). The globular molecular sieve 5A (MS5A) with the diameter of 3~5 mm was selected as the candidate for the CMSB in TBM TES. The MS5A was studied by means of the thermogravimetric analysis (TGA) and thermal desorption spectroscopy (TDS). The adsorption property of the adsorbent was also investigated in continuous He-H₂ purge gases with a flow rate of 33.6 L/min. The durability of MS5A was assessed according to the runtime of ITER. The results show that MS5A can extract traces of hydrogen from helium effectively, furthermore, the content of hydrogen was quite high in the regenerated gases of CMSB after saturated adsorption. The adsorbent can stand the test during the running of ITER. Therefore the MS5A could recover low concentration hydrogen effectively and reliably from the purge gases of the TBM during the operation of ITER.

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Session Classification: Poster Session

Track Classification: Nuclear fuel cycles, present Gen III+ NPPs, Gen IV and Th based reactors