

Characterisation and Optimisation of Small Molecular Sieve Beds in Adsorption/Desorption Process of Tritiated Water

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Tritiated water with different activity is continuously produced in tritium handling facilities. Adsorption columns with zeolites are widely used to remove tritiated water from gaseous streams. At TLK an experiment to process highly tritiated water with PERMCAT, has been installed in the CAPER facility. It comprises a small molecular sieve bed (MSB) downstream of the process, where the detritiated water is collected, followed by tritium accountancy using a non intrusive calorimetry method. The MSB is designed to collect water from one experimental run of PERMCAT lasting for 24 hours, which corresponds to approximately 15 g of water.

The requirements to fully regenerate the MSB are subjected to waste minimisation due to environmental and economical reasons. The regeneration process must be optimised with respect to the operational conditions and the amount of residual water. Full characterisation and optimisation of the regeneration procedure is studied within a specific and dedicated non active facility, in support to the design of a future apparatus handling tritiated water.

This study presents the results obtained for the isotherm adsorption and optimisation of the desorption phase using a range of experimental conditions such as temperature, pressure, concentration, residence time and gas flow rate. This provides useful information for the design of tritium processes relying on MSB, for example the processes foreseen for the test blanket modules in ITER.