

Development of Detritiation System of Air with Honeycomb Catalyst and Adsorbent

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Large amounts of tritium would be handled in D-T fusion power plants. Tritium is the radioisotope of protium, and is easily taken into the human body. With regard to nuclear fusion reactor facilities, the concept of multi-confinement system is applied to prevent tritium leaking to the environment. The last barrier to confine tritium is a building itself containing all equipment and facilities. If a severe accident takes place, tritium gas could leak into the facilities. In order to prevent tritium leaking to the environment, a secure air cleanup system (ACS) needs to be installed in the building. In ACS, the tritium gas, which leaks to rooms by an accident, is oxidized by catalysts, and then tritiated water vapor is collected by adsorbents. This method can remove tritium effectively, whereas which has a problem related to large ventilation force required to overcome high pressure drop in catalyst and adsorbent beds. Ventilation force could be substantially reduced by applying honeycomb catalysts and adsorbents to ACS because of their lower pressure drop compared with pebble beds. Akita University and National Institute for Fusion Science (NIFS) are now cooperatively carrying out a R&D for establishment of ACS based on honeycomb catalysts and adsorbent. We investigated applicability of honeycomb catalysts and adsorbents to ACS, performing a screening test for the performance of honeycomb catalysts and adsorbents. Moreover, further intensive studies have been performed in terms of pressure drop, catalytic activity, isotope effects on catalytic reaction, adsorption performance of water vapor, breakthrough behavior of adsorption and so force. Development of more effective honeycomb catalysts and adsorbents is also under progress. The results of these studies suggest that the honeycomb catalyst and adsorbent are highly applicable to ACS. In this paper, the outcomes of those studies are summarized, and more recent results are extensively presented. In addition, more detailed results of our studies are to be presented by our colleagues of Akita University and NIFS in different papers of this conference as well.