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Tritium release from Li4SiO4: The effect of material properties

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Lithium orthosilicate (Li4SiO4), in the form of ceramic pebble, is one of the most promising tritium breeder materials for fusion reactor blankets. Particularly, Li4SiO4 has been selected as the preferred breeder material for Chinese HCCB-TBM . For efficient extraction and recovery of bred tritium in the breeding blankets, it is important to have a thorough understanding of the mechanisms of tritium release from Li4SiO4 ceramic pebbles. In the present study, tritium release behaviors from two batches of Li4SiO4 pebbles with different material properties were investigated through out-of-pile experiments. Samples A, which were fabricated by a melt method, had high densities (~96%TD) and large grain sizes (100~300 μm), while samples B, which were fabricated by a wet method, had relatively low densities (~86%TD) and small grain sizes (10~50 μm). The results showed that tritium release temperature from samples A was much higher than that from samples B. Moreover, the fraction of tritium gas released from samples A was much larger than that from samples B, especially under helium purge gas. Based on these observations, the effect of material properties on tritium release behavior from Li4SiO4 pebbles was discussed. It was suggested that the grain size played an important role in the tritium release behavior. This study can provide a guideline for optimizing the fabrication process of Li4SiO4 pebbles.

Eligible for student paper award?

No

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