

Tritium Activities on Lithium Ceramic Breeder Materials in CAEP

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Development of ceramic tritium breeder materials is one the most important work in the fusion energy exploitation. Tritium release property is the key factors of the lithium ceramics served as tritium breeder. Tritium activities on the lithium ceramic have begun since 1980's with the financial support of the Chinese 863 project in China Academy of Engineering Physics (CAEP).

Out of pile tritium release experiment of -LiAlO_2 ceramic has been performed to study the tritium property. Diffusion coefficient and activity energy are calculated from 748K to 873K according to the relationship of $\lg D$ and T^{-1} . The results are agree with that the TRIO and VOM-22H.

The Chinese first in-pile tritium production demonstration apparatus in 300[#] reactor has been built in 1991. The in-pile tritium production apparatus includes mainly four parts, i.e. capsule, breeder, analysis system and monitoring system. The effect of some key factors upon tritium release was investigated from several runs of in-situ tritium release experiments. Until the capsule remove from the reactor, the total neutron fluence is up to $9.36 \times 10^{19} \text{cm}^{-2}$ and the total tritium collected is $1.49 \times 10^3 \text{GBq}$.

The D(diffusion coefficient) and Q(activation energy) of tritium has been determined in the in-situ tritium release experiment. ($D = 5.76 \times 10^{-16} \text{EXP}(-Q / RT) \text{m}^2 \cdot \text{s}^{-1}$ $Q = 70.6 \text{kJ} \cdot \text{mol}^{-1}$)

The results of the in-situ tritium release experiment show that tritium will release mostly as HT and HTO will increase if the tritium did not recovery from the irradiated ceramic in time. The experiments result shows that the performance of the apparatus was good, and its feasibility and the fundamental characteristics of continuous release of tritium from a solid breeder blanket were demonstrated.

Several kinds of wet process have been developed to fabricate lithium ceramic pebble (Li_4SiO_4 , Li_2TiO_3 and Li_3TaO_4) after China join ITER in 2003. Tritium release experiments for the CN TBM tritium breeder are now being performed. Some new results will also be introduced related to ITER in this report.

Select fields and topics (-8)

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