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The Influences of irradiation defects on mechanical properties for ceramic breeder material Li2TiO3

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Tritium breeder materials are significant for blanket design of fusion reactor. However, during blanket operation, the ceramic breeder materials will be subjected to neutron irradiation which could be detrimental to mechanical properties. Because of its good chemical stability and available tritium release behavior, Li2TiO3 is becoming one of candidate ceramic breeder materials.

In this study, Li2TiO3 samples are irradiated by 120keV deuterium ions. For sample characterization, the phase composition is investigated by using X-ray diffraction (XRD) before and after irradiation. After deuterium irradiation, the Electron spin resonance (ESR) experiments are employed to investigate the irradiation defects. Micro-hardness measurement is applied to study the changes of mechanical properties. XRD results indicate that Li2TiO3 crystals are damaged by deuterium irradiation, but no new phases are produced. According to ESR experiment, the defect type after deuterium irradiation is E-center which are vacancies trapping one electron. From Vickers hardness measurement, size effect of micro-hardness is observed. The Meyer coefficient obtained in the experiment is 1.65 which is less than 2. The Vickers hardness increases as applied loads decrease which are consistent to Meyer theory. And the Vickers hardness of the Li2TiO3 decreases as irradiation doses increase. The details of this condition are under investigation.

Eligible for student paper award?

No

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