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Study on considerable defects introduced in tritium breeding material Li_2TiO_3 by annealing in vacuum

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Li_2TiO_3 is one of the most promising candidates for solid breeder materials. However, defects introduced in Li_2TiO_3 will affect tritium release. In the present study, vacuum-annealing defects in Li_2TiO_3 were investigated by means of electron spin resonance (ESR). The defects of E-centers were found to be introduced by vacuum-annealing in Li_2TiO_3 . The color of Li_2TiO_3 samples becomes dark grey after annealing in vacuum. This color change suggests the change from Ti^{4+} to Ti^{3+} due to decrease in the oxygen content. And the color was observed to recover to initial color, white again after annealing in air. The concentration of vacuum-annealing defects reaches almost a constant when the pressure is lower than 10 Pa. The defect concentration increases as annealing temperature goes up and then decreases when the temperature reaches to a certain value. The amount of vacuum-annealing defects goes down and the color of Li_2TiO_3 samples recovers to white gradually when vacuum-annealing samples annealed in air at different temperatures. There are no defects and color change while Li_2TiO_3 samples anneal in air first and then transfer to vacuum tube rapidly for vacuum-annealing. More defects were introduced in Li_2TiO_3 samples immersed in water for 6 hours. This elucidates that the defects produced by vacuum-annealing are attributed to the reduction of water adsorbed in Li_2TiO_3 . Mass of Li_2TiO_3 was found to vary after the change of the atmosphere from nitrogen to air investigated by thermogravimetry. X-ray diffraction (XRD) results indicate that there are no modifications on Li_2TiO_3 crystal phases.

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Eligible for student paper award?

No

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