Feasibility Investigation on Lithium Titanate Powder Synthesis by Sol-Gel Method

Abstract

In the development of tritium breeding blankets, lithium metatitanate (Li2TiO3) is considered a leading candidate material because of its favorable tritium release properties at low temperatures (200–400 °C), low activation characteristics, good thermal conductivity and stability, and high mechanical strength.
Various methods have been extensively investigated for powder preparation, including solid-state reactions, the sol-gel method, wet-chemistry methods, hydrothermal methods, and solution combustion synthesis. The sol-gel method is an efficient approach for preparing ceramic powders using soluble lithium salts and organic titanates in ethanol or other solvents. This technique can produce ceramic powders with homogeneous composition and nanoscale particle size.
This project aims to synthesize Li2TiO3 powder via the sol-gel route, producing fine and homogeneous powders suitable for subsequent pebble fabrication. The student is expected to work with advanced laboratory equipments, including high-energy ball mills, muffle furnaces, and microscopy techniques.

References:
1. Lu, W., Wang, J., Pu, W., Li, K., Ma, S., & Wang, W. (2018). Sol-gel synthesis of lithium metatitanate as tritium breeding material under different sintering conditions. Journal of Nuclear Materials, 502, 349–355. https://doi.org/10.1016/j.jnucmat.2018.02.014
2. Wu, X., Wen, Z., Xu, X., Han, J., & Lin, B. (2009). Fabrication and improvement of the density of Li2TiO3 pebbles by the optimization of a sol-gel method. Journal of Nuclear Materials, 393(1), 186–191. https://doi.org/10.1016/j.jnucmat.2009.06.002

Only student from BE/BTech (Chemical Engineering) final year shall apply.

Academic Project Requirements:

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: B.E./B.Tech. Other

3) Academic Project duration:

(a) Total academic project duration: 12 Weeks
(b) Student's presence at IPR for academic project work: 3 Full working Days per week

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