

Synthesis and Characterization of Nano-Sized Lithium Titanate by Wet Chemistry Method

Abstract

Lithium titanate (Li_2TiO_3) is one of the potential candidates for tritium breeder materials. Lithium titanate will be filled inside the blanket module of a fusion reactor in form of a packed bed. The Li_2TiO_3 will be in form of spherical shape with 1-2 mm in diameter. To synthesize Li_2TiO_3 , there are various conventional methods such as solid-state reaction method, the sol-gel method, co-precipitation method, and hydrothermal method. The wet methods such as sol-gel, co-precipitation method, solution combustion, and hydrothermal method have distinct advantages such as atomic scale mixing, high phase purity and control over morphology compared to the solid-state reaction process.

The aim of the student will be to synthesize nano-sized Li_2TiO_3 powder by hydrothermal synthesis route. The synthesized powder shall be characterized for its phase purity by X-ray diffraction method, particle size by DLS (dynamic light scattering) method and surface morphology by SEM technique. Student shall produce the process parameters of the Li_2TiO_3 hydrothermal synthesis route. During the project tenure, student will get hands-on experience with advanced laboratory equipment, including high-energy ball mills, muffle furnaces, DLS particle size analyser, and thermogravimetric-differential thermal analyser.

Only final-year students from ME/MTech (Chemical Engineering or its sub-streams/specializations) shall apply.

References:

1. Abbasian, A. R., Rahimipour, M. R., & Hamnabard, Z. (2015). Hydrothermal Synthesis of Lithium Meta Titanate Nanocrystallites. *Procedia Materials Science*, 11, 336–341. <https://doi.org/10.1016/j.mspro.2015.11.110>
2. Wan, X., Cai, L., Tan, G., Hu, X., & Zhang, Y. (2023). A comparative study on the properties of Li_2TiO_3 powders and pebbles fabricated by different routes. *International Journal of Applied Ceramic Technology*, 20(3), 1478–1486. <https://doi.org/10.1111/ijac.14327>

Academic Project Requirements:

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

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

3) Academic Project duration:

(a) Total academic project duration: 36 Weeks

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

Email to: aroh@ipr.res.in[Guide's e-mail address] and
project_other@ipr.res.in [Academic Project Coordinator's e-mail address]

Phone Number: 079 -23962338 [Guide's phone number]