

# Feasibility investigation on Li<sub>2</sub>TiO<sub>3</sub> pebble fabrication by multi-nozzle freeze-granulation system

## Abstract

Lithium based ceramics are promising tritium breeding material for fusion reactor application. Out of various lithium based ceramic compounds, lithium titanate is selected as primary candidate material for Indian ceramic breeder concept. Lithium titanate is planned to be kept inside the fusion reactor in form of pebble bed with a diameter of ~ 1 mm. Various methods for fabricating these pebbles, such as extrusion-spheronization, gel casting, powder-injection molding, and pan granulation, are being explored globally. However, conventional methods struggle to produce ceramic pebbles with diameters of 1-3 mm that exhibit uniform physical properties. To address this challenge, the Institute for Plasma Research (IPR) has developed a small experimental setup for pebble fabrication using the freeze-granulation technique.

This project aims to experiment with preparing lithium ceramic balls with diameters less than 3 mm using the freeze-granulation method. The focus will be on achieving spherical shapes for both the green and sintered balls. Students involved in the project will gain practical experience in operating sophisticated equipment, including high-energy ball milling machines, freeze-drying systems, muffle furnaces, and microscopy techniques.

Relevant references [Publications, web links etc.]:

[1] A. Shrivastava, T. Kumar, R. Shukla, P. Chaudhuri, Li<sub>2</sub>TiO<sub>3</sub> pebble fabrication by freeze granulation & freeze-drying method, Fusion Eng. Des. 168 (2021) 112411.

## 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: 40 Weeks

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

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