

Investigation of Activation Energy and Reaction Mechanism in the Synthesis of Li_2SiO_3

Abstract

Lithium orthosilicate (Li_2SiO_3) has gained interest as a tritium breeder material in fusion reactors. It is a viable candidate for this purpose, as it can produce tritium when exposed to neutron irradiation. Li_2SiO_3 has strong thermal stability, excellent chemical compatibility with other reactor materials, and good tritium release characteristics. Furthermore, Li_2SiO_3 has a high lithium density, which improves tritium breeding efficiency. These qualities make it an essential component in the blanket of fusion reactors, where it plays a critical role in ensuring a continuous tritium supply for reactor operation.

Li_2SiO_3 is typically synthesized through a solid-state reaction with lithium carbonate (Li_2CO_3) and silicon dioxide (SiO_2) as raw materials. Several factors influence this reaction, including temperature, reaction duration, reactant particle size, and the presence of contaminants. Understanding the reaction kinetics of Li_2SiO_3 synthesis is critical for refining the synthesis process. Although Li_2SiO_3 is crucial in fusion technology, little research has been conducted on its reaction kinetics. A detailed investigation of reaction processes, rate constants, and activation energies is required to design efficient and scalable manufacturing procedures. This study intends to investigate the reaction kinetics of Li_2SiO_3 synthesis by thermal analysis. Student will get hands on experience with TG-DSC for thermal analysis, ball-milling for grinding, and high-temperature furnaces for Li_4SiO_4 synthesis.

Discipline Required: Chemical Engg. (Any sub-major is also acceptable)

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: 38 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 -07923962338 [Guide's phone number]