Indian Institute of Technology Delhi

School of Interdisciplinary Research (SIRe)

SIRe Project Number

2025-01-08

(will be assigned by SIRe)

PhD Project

Project Details	
Project Title	Design and Development of Solid Electrolytes for Na-ion Batteries
Project Summary	Na-ion batteries offer sustainability and safety over the conventional Li-ion batteries. Due to the inherent limitations of the liquid electrolyte used in Na-ion batteries, such as high flammability, high volume, and reactivity with the electrodes, Na-ion batteries cannot achieve desirable performance. While the solid-state configuration of the electrode offers high compactness and stability, achieving a high room-temperature ionic conductivity is immensely challenging. This project focuses on developing room-temperature ionically conductive electrolytes for safer Na-ion batteries. Specifically, the student will be responsible for performing the following activities: 1. Developing the electrode materials for Na-ion cells 2. Developing the solid electrolyte for Na-ion batteries 3. Materials characterizations to ensure the stability of the electrode materials 4. Designing a two-compartment cell for possible battery applications 5. Performance analysis of the as-developed battery Since this project requires a detailed understanding of the physical and chemical properties of various electrode materials, this project's scope is inherently interdisciplinary. The student's admittance suits the core nature of the SIRe.

PhD Supervisors

Role	**Faculty**	**Academic Unit in IITD**	**Email ID**
Supervisor 1	Prof. Vipin Kumar	Energy Science and Engineering	vkumar@dese.iitd.ac.in,
Supervisor 2	Prof. Rajendra Singh Dhaka	Physics	rsdhaka@physics.iitd.ac.in,

Project requirements (Student publications, experience required, etc)

Qualification:
B Tech/ BS in Chemical Engineering/Physics/Ceramic Engineering/Industrial Chemistry or related discipline (1st division)
MS/M Sc/ M Tech in Chemical Engineering/Physics/Ceramic Engineering/Industrial Chemistry or related discipline (1st division)

Experience required (Mandatory skills**)**

1. Experience in handling chemicals
2. Expertise in conducting electrochemical testing
3. Prior experience in batteries is preferable

Source of funding (IRD/FITT Project details, if any)
Candidate with his/her own fellowship/ Part-Time

Role of Faculty Members involved:
Supervisor-1: Prof. Vipin Kumar – Electrochemical characterization and development of cells **Supervisor-2:** Prof. Rajendra Singh Dhaka – Materials preparation and characterizations