Indian Institute of Technology Delhi

School of Interdisciplinary Research (SIRe)

SIRe Project Number
2023-01-18

(will be assigned by SIRe)

Project Proposal for Ph.D.

Project Details	
Project Title	**Interface Engineering of the Glass-electrolytes for the High-energy Batteries**
Project Summary (Minimum 500 and maximum 2000 characters)	Metal anode batteries are gaining importance owing to their high-energy density. Most electrolytes used in conventional metal anode batteries today are liquid-based because of adequate wetting of the electrodes, high ionic conductivity, low-interfacial resistance, and fast charging/discharging cycles. Even though liquid electrolytes are favorable for promoting charge transport and electrochemical storage, the issues such as decomposition of electrolytes, electrolyte leakage, flammability, and dendritic growth pose severe challenges for safety. Recently, glass electrolytes have demonstrated the highly reversible and stable operation of the metal anodes at room temperature; however, the cell is identified to suffer immensely from interfacial resistance. In the present proposal, the interfacial properties of the novel glass electrolytes will be studied using experimental and theoretical techniques.

Ph.D. Supervisors

Role	Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Prof. Hemant K. Kashyap	Chemistry	hkashyap@chemistry.iitd.ac.in
Supervisor 2	Prof. Vipin Kumar	DESE	vkumar@iitd.ac.in

Project requirements (Student qualifications, experience required, etc)

- Very good academic record with first division in bachelor's and master's degrees in Chemistry/Physics or related areas

Source of fellowship/funding (CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)
Candidate with his/her own fellowship is desirable.

Role of Faculty Members involved:
Dr. Hemant K. Kashyap's expertise on computational chemistry will be used to supervise the student to perform ab initio quantum chemical calculations and simulations for glass electrolytes in bulk and near interface. Dr. Vipin Kumar's expertise on batteries will be used for experimental characterization of different glass electrolytes.