



Project Proposal for Ph.D.

Project Details (The research problem must clearly indicate the need for an interdisciplinary approach)

Project Title	Solid Polymer Electrolytes with Self-Healing and Flame-Retardant Properties for Safer Lithium Batteries
Project Summary (Minimum 500 and maximum 2000 characters)	Solid polymer electrolytes (SPEs) offer a safer alternative to liquid electrolytes in lithium-ion batteries by eliminating leakage and reducing flammability. However, mechanical damage and cracking can cause short circuits and safety hazards. This project aims to develop flexible SPEs with fast self-healing and flame-retardant properties using supramolecular interactions and polymeric ionic liquids. The proposed materials are expected to simultaneously improve mechanical strength, self-healing capability, flame resistance, and ionic conductivity. The SPEs will be synthesized and evaluated for their mechanical, thermal, and electrochemical properties. The study is expected to contribute to the development of safer, flexible, and more reliable solid-state electrolytes for next-generation lithium-ion batteries.

Ph.D. Supervisors*
(Supervisor 1 and Supervisor 2 cannot be from the same department of IITD)

Role	Name of Faculty	Date of Superannuation [§] (DD/MM/YYYY)	Academic Unit in IITD/Institute/University	Email ID (Official) & Contact Number
Supervisor 1*	Prof. Bhanu Nandan	31/10/2039	Department of Textile and Fibre Engineering, IIT Delhi	nandan@iitd.ac.in
Supervisor 2	Prof. Amit Gupta	31/07/2046	Department of Mechanical Engineering, IIT Delhi	agupta@iitd.ac.in

*Supervisor 1 must be from IIT, Delhi.

+All cells in this table are mandatory fields that need to be filled by faculty for consideration of proposal.

§The date of superannuation of supervisors should be at least three years from the date of registration of selected candidates.

Project requirements (Student qualifications, experience required, etc)
*The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)

- M.Sc./M.Tech. in Chemistry/Physics/Materials Science & Engineering/Polymer Science/Chemical Engineering/Mechanical Engineering/Textile and Fibre Engineering
- Candidate with M.Sc. degree must have qualified GATE/NET exam
- Candidate with any prior experience and working in related areas, is not mandatory but will be given preference.

Source of fellowship/funding and project number
(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)

IRD Project (RM00094)/CSIR/UGC/DST-INSPIRE

Role of Faculty Members involved:

Supervisor-1	Prof. Bhanu Nandan will be involved in the synthesis and preparation of the novel solid polymer electrolyte . The group of Prof. Nandan has strong expertise in the area of material
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	and polymer chemistry as well as fiber science and technology.
Supervisor-2	Prof. Amit Gupta will be involved in battery assembly and its further electrochemical characterization/testing. The group of Prof. Gupta work extensively in the area of battery assembly, testing and modeling. His group also has the necessary facilities to carry out this work.

Note :-

1. Approval from the respective DRC/CRC/ScRC of your Department/Centre/School will be required for using the "Full-time Institute Assistantship (Category-wise) (FIA)" for selecting the students in SRe.
2. Declaration:- Faculty members, please ensure that you have at least 3 years of service left before superannuation along with adequate sitting space & lab facilities for the SRe student.
3. PI/s are also encouraged to submit joint proposals with AIIMS, NII, JNU and institutes with which IITD has an existing MoU. If the Co-PI (Supervisor 2) is from outside IITD, kindly share his/her detailed CV.
4. If a research scholar is to be considered for selection under the project fellowship, then the project should have a minimum of two-year duration remaining.
5. A candidate applying with a valid JRF/INSPIRE/any national level fellowship should have at least two-year validity from the date of joining the Ph.D. program.
6. The third supervisor's name (if required) can be added only after the formation of Student Research Committee (SRC) subject to a strong recommendation of SRC and subsequent approval from the competent authority.
7. If institute fellowship is being sought then the DRC approval of the parent departments of both supervisors is required at the time of selection.