



Project Proposal for Ph.D.

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

Project Title	Energy harvesting using Triboelectric Nanogenerator (TENG) using meltblown polymer microfiber
Project Summary (Minimum 500 and maximum 2000 characters)	Triboelectric effects, one of the oldest effects known to mankind, has recently emerged as a potential and promising energy harvesting mechanism. Here in this project, we would like to explore energy harnessing by the friction of different polymeric materials, where the targeted substrates are robust melt blown microfibrinous membranes which will lead to a potential application in wearable and functional textiles. Amidst the work on polymers and/or textile materials for triboelectric energy generation, insignificant efforts have been considered on the role of architectural features, like fiber dimension, porosity and basis weight on the triboelectric performances of such materials, as well as in waste valorization in such applications, when plastic wastes are abundant. At the same time, the role of second-phase materials, like carbon nano tube, oxides, conductive materials etc. is also unexplored in terms of detailed characterization and inference. Hence, in this project we would like to investigate the method of charge generation by surface probe techniques and explore its opportunities in Internet of things (IoT) based devices. Eventually, such material will be incorporated into textile fabric to render it functional for various applications.

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

Role	Name of Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1*	Sumit Sinha Ray	DTFE	ssinharay@textile.iitd.ac.in
Supervisor 2	Ankur Goswami	DMSE	agoswami@mse.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)

- BTech and MTech in Chemical/Mechanical/Materials/Polymer or allied field with CGPA ≥ 7
- Candidates with any prior knowledge on polymer extrusion/ spinning and experience on electric motors, materials synthesis or experience in nanofabrication will be given preference although not mandatory.

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

Candidate with his/her own fellowship /institute assistantship

Role of Faculty Members involved:

Supervisor-1	Development of fibrous membrane; Structural and electrical characterization
Supervisor-2	Characterizations of materials (HRXRD, SEM, and various modules of AFM such EFM, KPFM, MFM, conducting mapping) and electrical transport measurements

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 DRC approval of the parent department of Supervisor 1 is required at the time of selection.**