



Project Details

Project Title

Energy harvesting using triboelectric Nanogenerator using electrospun polymer nano/microfibre

Project Summary

(Minimum 500 and maximum 2000 characters)

In the era of green energy harnessing electrical energy from mechanical vibration is indispensable. Triboelectric effect, one of the oldest effects known to mankind, has recently emerged in the last decade as a potential and promising energy harvesting mechanism where energy can be harnessed by friction between any two dissimilar materials. Here in this project, we would like to explore energy harnessing by the friction of different polymeric materials, where the targeted substrates are electrospun nano/microfibrous membranes which will lead to a potential application in wearable and functional textiles. Although, a significant work has been conducted 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. At the same time, the role of second-phase materials, like carbon nano tube, oxides, conductive materials etc. in the minuscule length scale (~500 nm) 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 in textile fabric to render it functional for various applications.

Ph.D. Supervisors

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

Project requirements (Student qualifications, experience required, etc)

Candidate should have the qualification of B.Tech in Electrical, Electronics, Mechanical, Materials Engineering, Polymer Sci & Technology, Textile Engineering, Or in MSc. in Physics, Physical Chemistry, Electronics. Students qualified CSIR/UGC JRF are strongly encouraged to apply. Candidates with any prior knowledge on instrument interfacing by LabView, Python related software, or experience on electric motors, materials synthesis or experience in nanofabrication will be given preference although not mandatory.

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

Role of Faculty Members involved:

In the proposed project two faculty members (Prof. Sinha Ray and Prof. Goswami) have few overlap areas of research, and have broad complementary expertise. For example, both the faculties have experience in materials characterization. However, Prof. Sinha Ray's experience and expertise is in fabrication of electrospun nanofibers from different polymers with inclination toward control in variable coating thickness, along with architectural factors and functional coating with or without ultra-high-speed gas-assisted jet. Prof. Ankur Goswami's expertise is largely in instrument design and development characterizations of materials (HRXRD, SEM, and various modules of AFM such EFM, KPFM, MFM, conducting mapping) and electrical transport measurements. The student assigned for this project will have access to both MSE and DTFE departmental facilities and various central facilities of IITD.