



Indian Institute of Technology Delhi
School of Interdisciplinary Research (SIRe)



SIRe Project Number

2024-01-33

(will be assigned by SIRe)

Project Proposal for Ph.D.

Project Details

Project Title	Smart Textiles for Thermal Management
Project Summary (Minimum 500 and maximum 2000 characters)	Textiles play a vital role in shielding and protecting the human body from undesirable cold weather. However, conventional textile is not smart enough to self-regulate the rapid change of temperatures. It is important to develop textiles with localized heating which will be achieved by integrating suitable nanomaterials and conductive systems. This project aims to develop textiles with active and passive thermal regulatory systems through a multiscale approach.

Ph.D. Supervisors

Role	Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Dr. Harun Venkatesan	Textile and Fibre Engineering, IIT Delhi	harun@iitd.ac.in, 9940881010
Supervisor 2	Dr. Krishna Bharadwaj Balasubramanian	Department of Material Science and Engineering	bkrishna@mse.iitd.ac.in, 9080521221

Project requirements (Student qualifications, experience required, etc)

- B.Tech / ME / M.Tech/ (Material Science and Engineering, Polymer science, Textile Chemistry, Textile Engineering, Material Science and Engineering, Chemical Engineering); MSc Textile Chemistry/ Fabric and Apparel Science or Equivalent from a recognized institute/university.
- GATE/ UGC - NET qualified
- Knowledge of fundamental textile/ apparel design concepts including fiber specification and testing, fabric characterization, textile manufacturing processes, etc.
- Design and fabrication of functional fabric using coating techniques and development of formulations for coating.

Source of fellowship/funding

(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)

UGC-NET

Role of Faculty Members involved:

Dr. Harun Venkatesan: He will be responsible for the experimental part in developing advanced additives, optimization of formulations, fibre integration and process control to fabricate heating textiles. His expertise will be utilized in material development and characterization, evaluation of fabrics for physical /chemical, optical, thermal properties and performance assessment through field studies.

Dr. Krishna Bharadwaj Balasubramanian: He will be involved in nanoparticle synthesis, transfer them into textiles through advanced fabrication routes. Further, his expertise of opto-electronic properties will be beneficial in optimizing performance of fabrics for heating.

Brief profile of the faculty member:

Dr. Harun Venkatesan received his PhD from the Institute of Textiles and Clothing at The Hong Kong Polytechnic University in 2020. Before joining IIT Delhi as an Assistant professor in 2022, he was a research fellow at The Hong Kong University of Science and Technology, supported by prestigious Research Talent Hub Postdoctoral Fellowship. His current research focus on development of aerogels for thermal insulation and radiative cooling properties. He has published more than 12 articles in Q1 journals including Advanced Functional materials, Nature Communications and Advanced Materials and 3 book chapters. He is currently supervising 3 MTech students focused on developing advanced thermal insulation materials. He was recently awarded Start-up Grant from Science & Engineering Research Board.

Dr. Krishna Balasubramanian did his bachelor's in electrical and electronics engineering at PSG College of Technology, Coimbatore. He worked for two years in the hardware design group of optical transport business unit, Cisco Systems Inc. He designed and implemented logical circuits using FPGAs and ASICs for high speed (upto 100 GHz) optical communication channels. Subsequently he joined as a direct PhD candidate at the Indian Institute of Science under the guidance of Prof. Rudra Pratap and Prof. Srinivasan Raghavan. He conducted research on low dimensional layered materials such as graphene, MoS₂ and quantum well structures involving GaN/AlGa_N systems. After obtaining his PhD from the Center for Nanoscience and Engineering, Indian Institute of Science, he joined as a post-doctoral fellow at the ultrafast quantum optics lab in electrical engineering department of Technion – Israel Institute of Technology. He was an assistant professor at the Electrical Engineering department at IIT – Kanpur for

an year and currently associated with the department of material science and engineering at IIT - Delhi. His research is focused on the interfaces of superconductors with low dimensional materials for interesting opto-electronic properties. He also works on high-temperature superconducting devices such as single photon detectors, nano-inductors and tunnel/super-Schottky diodes.