Project Proposal for Ph.D.

Project Details

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<tr>
<th>Project Title</th>
<th>Super-cooling Textiles for Personal Thermal Management</th>
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**Project Summary**

In current scenario of aggravating global energy crisis, temperature regulation required for human comfort consumes very high amount of energy. In addition to economic concerns, raising average temperatures and frequent heat waves due to climate change may cause severe health issues to public. Textiles play a vital role in shielding and protecting the human body from undesirable hot and cold weather. However, garments made from conventional textile are not smart enough to self-regulate the rapid change of temperatures. It is important to develop to textile with localized outdoor cooling without intensive energy input. This project aims to develop clothing that can regulate radiative energies from both external macro-climate and clothing micro-climate for efficient passive cooling through multiscale approach. Overall comfort properties of textiles will be optimized by developing numerical models for the proposed problem.

**Ph.D. Supervisors**

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<tr>
<th>Role</th>
<th>Faculty</th>
<th>Academic Unit in IITD/Institute/University</th>
<th>Email ID (Official)</th>
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<tbody>
<tr>
<td>Supervisor 1</td>
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**Project requirements (Student qualifications, experience required, etc)**

- ME/ M.Tech (Polymer science, Textile Chemistry, Material Science and Engineering, Chemical Engineering); MSc Textile Chemistry.
- Knowledge of fundamental textile design concepts including fiber specification and testing, fabric characterization, textile manufacturing processes, etc.
- Knowledge of nanomaterials, crosslinking chemistries, coupling reactions.
- Design and fabrication of functional fabric using coating techniques and development of formulations for coating.
- Knowledge of fundamentals of heat transfer, numerical modelling and human trial will be an advantage.
**Source of fellowship/funding**
(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)

Institute/ CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT

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**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 radiative cooling 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. Udayraj: He will be involved in fabric/clothing sample preparation, finalizing experimental protocols, testing and performance analysis of fabric/clothing in terms of their ability of providing thermal comfort, protection and improvement in radiative properties. Further, his expertise of numerical modeling of heat and mass transfer through textile materials will be beneficial in developing numerical model for the proposed problem and applications. This is essential to optimize performance of fabrics for radiative cooling.