Anupam Chowdhury
PhD student
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EDUCATION

Ph.D. (January 2018 – September 2024 (expected))

Department of Textile and Fibre Engineering, Indian Institute of Technology Delhi

Dissertation: Study of shape memory coupled piezoelectric nanocomposites

Master of Technology in Polymer Science and Technology (2015-2017)

Department of Chemical Sciences, Tezpur University

Dissertation: Development of Biodegradable Superabsorbent Nanocomposite Hydrogel Based on Modified Gelatin

Courses taken: Industrial Polymers, Polymer Characterisation and Analysis, Processing and Fabrication of Polymers, Polymer Rheology and Morphology, Rubber Science and Technology, Polymer Composites and Blends, Nanomaterials and Nanocomposites

Bachelor of Technology in Jute Technology (2009 -2013)

Department of Jute and Fibre Technology, University of Calcutta

Dissertation: Studies on time dependent mechanical behavior of jute yarn

Courses Taken: Fibre Science and Technology, Yarn Manufacture, Fabric Manufacture, Textile Testing, Textile Chemical Processing and Finishing, Engineering Mathematics

MAJOR RESEARCH EXPERIENCE

Doctoral Student ***Jan 2018-present***

Department of Textile and Fibre Engineering

Indian Institute of Technology Delhi

PhD Advisors: Dr Wazed Ali and Dr Bipin Kumar

Domain areas:

- Piezoelectric ceramic synthesis by hydrothermal method
- Characterization of synthesized material by crystallographic method (XRD), thermal (TGA),

morphology (SEM, FESEM, TEM), chemical composition (FTIR, Raman spectroscopy, XPS)

- Dielectric by LCR, Ferroelectric by PE loop tester, Piezoelectric characterization by PFM
- Fabrication of polymer nanocomposites by melt mixing, compression molding, solution casting
- Melt extrusion of polymer fibres by twin screw extruder, drawing and heat setting
- Integration of fibres into flexible wearables by weaving, knitting
- Device development by employing different electrode mechanisms, encapsulation methods
- Shape memory fibre production and its thermomechanical characterization in order to find strain fixity and recovery

Softwares used: Thermofisher Scientific Omnic spectra for FTIR, Panalytical Xpert for XRD, Origin, Chemdraw, Fusion 360(basic), Materials Studio for polymer structure building and geometry optimization, VESTA for visualization, Materials Project database for crystal structures.

M.Tech in Polymer Science and Technology **2015-2017**

Department of Chemical Sciences, Tezpur University, Assam, India

Thesis Advisor: Prof. Swapan Kumar Dolui

Domain areas:

- Polymer synthesis by bulk polymerization, solution polymerization and emulsion polymerization
- Preparation of fibre reinforced polymer composite
- Estimating the molecular weight of the polymer by Ubbelohde viscometer
- Hydrogel synthesis and its controlled release of fertilizers
- Optimization of experiments by Design Expert software using Central Composite Design
- Characterization by FTIR, DSC, XRD, TEM

B.Tech in Jute Technology **2009-2013**

Department of Jute and Fibre Technology

University of Calcutta

Thesis Advisor: Prof. Asis Mukhopadhyay

Domain areas:

Studied the stress-strain behavior of jute fibres

Studied the creep behavior of jute yarn

Computed the important parameters of Meredith Equation following viscoelastic model

PROFESSIONAL EXPERIENCE

- Preparation of technical draft of IEC (International Electrotechnical Commission) standards of Future IEC 63203-20X- X: Wearable electronic devices and technologies- Part 20X-X: Test method for measuring performance of fabric based piezoelectric nanogenerator (ongoing)

- Preparation and validation of composite extruded materials for specialized applications (Quantum Copper Inc., USA)

PUBLICATIONS

- Nath, J., **Chowdhury, A**., & Dolui, S. K. (2018). Chitosan/graphene oxide-based multifunctional pH-responsive hydrogel with significant mechanical strength, self-healing property, and shape memory effect. *Advances in Polymer Technology*, *37*(8), 3665-3679.
- Nath, J., **Chowdhury, A**., Ali, I., & Dolui, S. K. (2019). Development of a gelatin-g-poly (acrylic acid-co-acrylamide)– montmorillonite superabsorbent hydrogels for in vitro controlled release of vitamin B12. *Journal of Applied Polymer Science*, *136*(22), 47596.
- Nath, J., Ahmed, A., Saikia, P., **Chowdhury, A**., & Dolui, S. K. (2020). Acrylic acid grafted gelatin/LDH based biocompatible hydrogel with pH-controllable release of vitamin B12. *Applied Clay Science*, *190*, 105569.
- Bairagi, S., Banerjee, S., **Chowdhury, A**., & Ali, S. W. (2021). Development of a sustainable and flexible piezoelectric-cum-triboelectric energy harvester comprising a simple commodity cotton fabric. ACS Sustainable Chemistry & Engineering, *9(11)*, 4004-4013.
- Raj, A., **Chowdhury, A**., & Ali, S. W. (2022). Green chemistry: its opportunities and challenges in colouration and chemical finishing of textiles. *Sustainable Chemistry and Pharmacy*, *27*, 100689.
- **Chowdhury, A**., Bairagi, S., Ali, S. W., & Kumar, B. (2020). Leveraging shape memory coupled piezoelectric properties in melt extruded composite filament based on polyvinylidene fluoride and polyurethane. *Macromolecular Materials and Engineering*, *305*(12), 2000296.

- Bairagi, S., **Chowdhury, A**., Banerjee, S., Thakre, A., Saini, A., & Ali, S. W. (2022). Investigating the role of copper oxide (CuO) nanorods in designing flexible piezoelectric nanogenerator composed of polyacrylonitrile (PAN) electrospun web-based fibrous material. *Journal of Materials Science: Materials in Electronics*, *33*(16), 13152-13165.
- Gadkari, R. R., Garg, H., **Chowdhury, A**., & Ali, W. (2022). Chitosan-based bionanocomposites for food packaging applications. In *Bionanocomposites for Food Packaging Applications* (pp. 181-200). Woodhead Publishing.
- Ali, S. W., **Chowdhury, A**., Banerjee, S., & Bairagi, S. (2022). Bio resources mediated technological advancements in chemical finishing of textiles. In *Applications of Biotechnology for Sustainable Textile Production* (pp. 187-220). Woodhead Publishing.
- Ali, S. W., **Chowdhury, A**., Bairagi, S., & Banerjee, S. (2022). Green nanomaterials for multifunctional textile finishes. In *Green Functionalized Nanomaterials for Environmental Applications* (pp. 343-364). Elsevier.
- Ali, S. W., **Chowdhury, A**., Nath, J., Dolui, S. K., & Gadkari, R. R. (2021). Cellulose-based bionanocomposites in tissue engineering and regenerative medicine. In *Bionanocomposites in Tissue Engineering and Regenerative Medicine* (pp. 451-463). Woodhead Publishing.
- Ali, S. W., Bairagi, S., & **Chowdhury, A**. (2022). Biodegradable nanocomposites: Effective alternative of synthetic polymer in electronic industries. In *Green Nanomaterials for Industrial Applications* (pp. 423-443). Elsevier.
- Ali, S. W., & **Chowdhury, A**. (2022). Polybutylene succinate based bionanocomposites for food packaging applications. In *Bionanocomposites for Food Packaging Applications* (pp. 165-180). Woodhead Publishing.
- **Chowdhury, A**., Bairagi, S., Kumar, B., & Ali, S. W. (2020). Composite Electrospun Nanofibers for Energy Scavenging Applications. In *Nanotechnology in Textiles* (pp. 471-505). Jenny Stanford Publishing.
- **Chowdhury, A**., Das, S., & Ali, W. (2023). 15 Smart textiles for energy harvesting applications. In Smart and Functional Textiles (pp. 607–634). De Gruyter. https://doi.org/10.1515/9783110759747-015
- Roy, S., **Chowdhury, A**., Joshi, M., & Ali, W. (2024). Flexible and high-temperature stable nanofiber composite made of PEI/KNN for energy harvesting. *Journal of Materials Science*, *59*(1), 171-187.
- Roy, S., **Chowdhury, A**., Joshi, M., & Ali, S. W. (2024). Flexible PEI/PVDF Blend Films with an Enhanced Curie Temperature for Piezoelectric Energy Harvesting. *ACS Applied Electronic Materials*, 6(4), 2142-2151
- Das, S., **Chowdhury, A**., & Ali, S. W. (2024). A Critical Review on Triboelectric Nanogenerators

(TENGs) with Flame Retardant, Antibacterial, Self-Cleaning, or Water Repellent Properties. *ACS Applied Electronic Materials*, *6*(4), 2093-2119.

- Das, S., Mirlekar, M. N., Banerjee, S., **Chowdhury, A**., & Ali, S. W. (2024). Cellulose-Based Hybrid Piezoelectric Materials. *Hybrid Materials for Piezoelectric Energy Harvesting and Conversion*.
- **Chowdhury, A**., Das, S., Mirlekar, M. N., & Ali, S. W. (2024). $ZnSnO_3$-Based Hybrid Piezoelectric Materials. *Hybrid Materials for Piezoelectric Energy Harvesting and Conversion*.
- Das, S., **Chowdhury, A**., & Ali, S. W. (2024). Wearable, Machine Washable, Breathable Polyethyleneimine/ Sodium Alginate Layer-by-Layer Coated Cotton Based Multifunctional Triboelectric Nanogenerator. *ACS Applied Materials and Interfaces* (accepted)

HONORS AND AWARDS

- Anundoram Barooah Award 2005 awarded by Government of Assam for merit-based result in Secondary Examinations
- Engineering and Technology Scholarship (2015-17) awarded by Department of Technical Education, Government of Assam during M.Tech in Polymer Science and Technology
- AIR 69 in GATE 2016 organized by Ministry of Human Resource Department, Government of India
- Awarded 3rd prize in ‘Innovation is in my DNA!’ contest (2016) by Asian Paints for presentation on Graphene based surface coatings
- Cover art selected for December 2020 edition of Macromolecular Materials and Engineering, Wiley
- Cover art selected for April 2024 edition of ACS Applied Electronic Materials, American Chemical Society

TEACHING ASSISTANTSHIP

- Manufactured Fibre Technology Lab
- Technology of Textile Preparation & Finishing Lab
- Technology of Textile Coloration Lab

COURSES AND CERTIFICATIONS

Nanotechnology and Nanosensors, Part 1,
Coursera August 2020
Technion - Israel Institute of Technology
CREDENTIAL ID: 97MCCDTSUBPQ

REFERENCES

Dr. Wazed Ali
Associate Professor
Department of Textile and Fibre Engineering IIT Delhi
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Dr. Bipin Kumar
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Department of Textile and Fibre Engineering
IIT Delhi
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