

# Curriculum Vitae

## SOMA BANERJEE

Assistant Professor

Harcourt Butler Technical University, Kanpur

PhD, M. Tech. & B. Tech.

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### Research Achievements:

Published **14** research articles in international journals (**10** articles as **1<sup>st</sup> Author**) and **28** book chapters in reputed publisher's books. **1** Indian patent has been granted. Presented **5** poster presentations in Conferences and **delivered talks on 2** occasions. **Co-editor of conference proceeding** whose details are enclosed in the later sections.

### Project Completed:

Completed Project on "**Development of Self-healing Polymer Electrolyte Membrane for Fuel Cells**" as **Women Scientist Fellow (Principle Project Investigator)** sanctioned by **DST, Government of India** (Project cost Rs. 33.47 lac).

### Managerial Works:

- **Worked as an active member of the conference organizing committee** in 2010 and 2019 (details enclosed) and **conducted the activities** for smooth execution of the sessions.
- Worked for the **planning and execution of Quality Improvement Programmes (QIP)** arranged at Advanced Nano Engineering Laboratory, IIT Kanpur on several occasions (2010, 2011 and 2013).
- **Demonstrated** Thermogravimetric Analyzer and Differential Scanning Calorimeter instruments to the delegates and students participated in the QIP Programmes.
- **Handled** Thermogravimetric Analyzer, Differential Scanning Calorimeter and X-ray Diffraction instruments and tested more than 450 samples.
- **Conducted** the Graduate Seminars at IIT Kanpur during the course works.
- As a scientist of the new division at Indian Jute Industries Research Associations **established the complete laboratory setup**.

### Awards:

- ❖ **University Gold Medal** for securing **Rank 1** in M. Tech. (Polymer Science & Technology), University of Calcutta
- ❖ **INSPIRE Fellow** of Department of Science & Technology, Government of India
- ❖ **Women Scientist Fellow** of Department of Science & Technology, Government of India
- ❖ **Poster Award: Soma Banerjee (Presenter)**, Subhomoy Das, Manas K Ghorai, Kamal K Kar, "*Synthesis and Characterization of Polymer Electrolyte Membrane for Fuel Cell*"

Applications”, National Conference on Carbon Materials 2012 (CCM12), November 01-03, 2012, BARC Mumbai.

Google Scholar Statistics:

Link: [https://scholar.google.com/citations?user=811Z\\_0EAAAAJ&hl=en](https://scholar.google.com/citations?user=811Z_0EAAAAJ&hl=en)

Scopus Statistics:

Link: <https://www.scopus.com/authid/detail.uri?authorId=57199687036>

Web of Science Statistics:

Link: <https://www.webofscience.com/wos/author/record/5229530>

### 1. Education:

<i>Degree</i>	<i>Subject</i>	<i>University/Institute</i>	<i>Year of passing</i>	<i>Class</i>
Ph. D.*	Materials Science Programme	Indian Institute of Technology Kanpur	2016	-
M. Tech.	Polymer Science & Technology	University of Calcutta	2009	1 <sup>st</sup>
B. Tech.	Polymer Science & Technology	University of Calcutta	2007	1 <sup>st</sup>

\***Thesis Title: Sulfonated and Phosphonated Poly(ether ether ketone) based Polymer Electrolyte Membranes for Fuel Cell Application.**

### 2. Other Educational Qualification:

Qualified GATE 2008 (Engineering Science)

### 3. Experience:

Total Experience: 5 years

#### **Pre PhD experience:**

**i) Employer: Indian Jute Industries Research Association (IJIRA)**

**Designation:** Scientist grade I

**Job Profile:** Involved in research work related to jute fiber based polymer composites

#### **Post PhD experience:**

**i) Employer: Indian Institute of Technology Kanpur**

**Designation:** Project Scientist

**Job Profile:** Involved in research work related to Fuel Cell Membranes and Polymer Composites, Bipolar Plate and Waste water treatment

**ii) Employer: Indian Institute of Technology Kanpur**

**Designation:** Project Post-Doctoral Fellow

**Job Profile:** Involved in research work related to Polymer Electrolyte Membranes for Fuel Cell and Polymer Composites, Bipolar Plates, Electroless coating

**iii) Employer: Indian Institute of Technology Kanpur**

**Designation:** DST Women Scientist Fellow

**Job Profile:** Development of self-healing, long lasting Polymer Electrolyte Membranes for low temperature Fuel cells

**iv) Employer: Harcourt Butler Technical University, Kanpur**

**Designation:** Guest Faculty

**Department:** Plastic Technology

**v) Employer: Harcourt Butler Technical University, Kanpur (June, 2022)**

**Designation:** Assistant Professor

**Department:** Plastic Technology

**4. Research Areas:**

Polymer electrolyte membranes for Fuel cells, Supercapacitor, Polymer composites and nanocomposites, Synthesis and characterization of functionalized polymers for fuel cell membranes, Synthesis and characterization of different hydrophilic nanoparticles, Bipolar Plate and Waste water treatment

**5. Professional Membership:**

Life Member, Indian carbon society

**6. Patent Granted:**

*Patent on "Novel phosphonated poly ether ether ketone polymer as an alternative to Nafion for polymer electrolyte membrane fuel cell and the method of manufacturing the same"*, Kamal K. Kar and **Soma Banerjee (Patent No. 335818)**.

**7. Details of Publications:**

1. Impact of Degree of Sulfonation on Microstructure, Thermal, Thermomechanical and Physicochemical Properties of Sulfonated Poly ether ether ketone  
**Soma Banerjee** and Kamal K. Kar  
*Polymer*, 2017, 109, 176-186, **I. F. 4.43**
2. Graphene oxide (rGO)-metal oxide (TiO<sub>2</sub>/Fe<sub>3</sub>O<sub>4</sub>) based nanocomposites for the removal of methylene blue  
**Soma Banerjee**, Poonam Benjwal, Milan Singh, Kamal K. Kar  
*Applied Surface Science*, 2018, 439, 560–568, **I. F. 6.707**

3. Superior Water Retention, Ionic Conductivity and Thermal Stability of Sulfonated Poly ether ether ketone/Polypyrrole/Aluminium Phosphate Nanocomposite based Polymer Electrolyte Membrane  
**Soma Banerjee** and Kamal K. Kar  
*Journal of Environmental & Chemical Engineering*, 2016, 4, 299–310, **I. F. 5.909**
4. Synergistic Effect of Aluminium Phosphate and Tungstophosphoric Acid on the Physicochemical Properties of Sulfonated Poly ether ether ketone Nanocomposite Membrane  
**Soma Banerjee**, Kamal K. Kar  
*Journal of Applied Polymer Science*, 2016, 133, 42952 (1)-(11), **I.F. 3.125**
5. Mechanical Analysis of Nickel Particle-Coated Carbon Fiber-Reinforced Epoxy Composites for Advanced Structural Applications  
Amit Kumar Yadav\*, **Soma Banerjee\***, Ravindra Kumar, Kamal K Kar, Janakarajan Ramkumar, and Kinshuk Dasgupta  
\* **Equal contributions.**  
*ACS Appl. Nano Mater.* 2018, 1, 4332–4339, **I.F. 5.097**
6. Biowaste derived activated carbon electrocatalyst for oxygen reduction reaction: Effect of chemical activation  
Alekhya Tyagi, **Soma Banerjee**, Shashank Singh, Kamal K. Kar  
*International J. Hydrogen Energy*, 2020, 45, 16930-16943, **I.F. 5.816**
7. Synthesis of Poly ether ether ketone Membrane with Pendent Phosphonic Acid Group and Determination of Proton Conductivity and Thermal Stability  
**Soma Banerjee**, Kamal K. Kar, Manas K. Ghorai and Subhomoy Das  
*High Performance Polymers*, 2015, 27, 402-411, **I. F. 2.161**
8. Aluminium Substituted Phosphotungstic Acid/Sulfonated Poly ether ether ketone Nanocomposite Membrane with Reduced Leaching and Improved Proton Conductivity  
**Soma Banerjee**, Kamal K. Kar  
*High Performance Polymers*, 2016, 28, 1043-1058, **I. F. 2.161**
9. Synthesis and thermoelectric performance of titanium diboride and its composites with lead selenide and carbon  
Iram Malik, **Soma Banerjee**, Chhatrasal Gayner, Abhijnan Chowdhuri, and Kamal K. Kar  
*Ceramics International*, 2018, 44, 10685–10692, **I.F. 4.527**
10. Dynamic mechanical properties of Zinc oxide reinforced linear low density polyethylene composites  
Abhimanyu Tharayil, **Soma Banerjee** and Kamal Krishna Kar  
*Materials Research Express*, 2019, 6, 055301-1-16, **I.F. 1.62**

11. Impact of Graphite on Thermomechanical, Mechanical, Thermal, Electrical Properties, and Thermal Conductivity of HDPE/Copper Composites  
**S. Banerjee**, S. Pattnayek, R. Kumar, K. K. Kar  
FUEL CELLS, 2020, 20, 116–130, **I.F. 2.25**
12. Particulate Filled Polymer Electrolyte Membrane for Fuel Cell Applications  
**Soma Banerjee** and Kamal K. Kar  
*Recent Patents on Materials Science*, 2014, 7, 131-150
13. Electrolyte Membranes for Fuel Cells: Synthesis, Characterization and Degradation Analysis  
**Soma Banerjee**, Kamal K. Kar and Malay K. Das  
*Recent Patents on Materials Science*, 2014, 7, 173-203
14. Bipolar Plate Materials for Proton Exchange Membrane Fuel Cell Application  
Rajeev K. Gautam, **Soma Banerjee** and Kamal K. Kar  
*Recent Patents on Materials Science*, 2015, 8, 15-45

## **8. Chapters Published in Books:**

1. Polymeric Materials  
**Soma Banerjee**, L. Sowntharya, S. Pramanick, M. Ghorai and Kamal K. Kar  
In *Developments in Nanocomposites*, Editors: Kamal K. Kar and A. Hodzic, Research Publishing Services, Singapore, 2014, ISBN-13: 978-981-08-3711-2, ISBN-10: 981-08-3711-9.
2. Overview of Polymer Nanocomposites  
**Soma Banerjee** and Kamal K. Kar  
In *Developments in Nanocomposites*, Editors: Kamal K. Kar and A. Hodzic, Research Publishing Services, Singapore, 2014, ISBN-13: 978-981-08-3711-2, ISBN-10: 981-08-3711-9.
3. Nanocomposites based on Carbon Nanomaterials and Electronically Nonconducting Polymers  
**Soma Banerjee**, Raghunandan Sharma, Kamal K. Kar  
Composite Materials: Processing, Applications, Characterizations, Springer Heidelberg New York Dordrecht, London, 2017, ISBN-10: 3662495120, ISBN-13: 978-3-662-49512-4, ISBN 978-3-662-49514-8.
4. Capacitor to Supercapacitor  
**Soma Banerjee**, Prerna Sinha, Kapil Dev Verma, Tanvi Pal, Bibekananda De, Jayesh Cherusseri, P. K. Manna and Kamal K. Kar  
Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol. 300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2
5. Applications of Supercapacitors  
**Soma Banerjee**, Bibekananda De, Prerna Sinha, Jayesh Cherusseri, Kamal K. Kar  
Pages 341-350

- Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol. 300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2
6. Characteristics of Carbon Nanotubes  
**Soma Banerjee** and Kamal K. Kar  
Pages 179-214  
Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol. 300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2
  7. Characteristics of Transition Metal Oxides  
Alekha Tyagi, **Soma Banerjee**, Jayesh Cherusseri, Kamal K. Kar  
Pages 91-123  
Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol.300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2
  8. Characteristics of Activated Carbon  
Prerna Sinha, **Soma Banerjee**, Kamal K. Kar  
Pages 125-154  
Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol. 300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2
  9. Characteristics of Graphene/Reduced Graphene Oxide  
Pankaj Chamoli, **Soma Banerjee**, K. K. Raina, Kamal K. Kar  
Pages 155-177  
Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol. 300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2
  10. Characteristics of Conducting Polymers  
Tanvi Pal, **Soma Banerjee**, P. K. Manna, Kamal K. Kar  
Pages 247-268  
Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol. 300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2
  11. Characteristics of Electrolytes  
Kapil Dev Verma, **Soma Banerjee**, Kamal K. Kar  
Pages 287-314  
Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol. 300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2
  12. Characteristics of Electrode Materials for Supercapacitors  
Kapil Dev Verma, Prerna Sinha, **Soma Banerjee**, Kamal K. Kar  
Pages 269-285  
Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol. 300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2
  13. Characteristics of Separator Materials for Supercapacitors  
Kapil Dev Verma, Prerna Sinha, **Soma Banerjee**, Kamal K. Kar, Manas K. Ghorai  
Pages 315-326  
Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol. 300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2

14. Characteristics of Current Collector Materials for Supercapacitors  
Kapil Dev Verma, Prerna Sinha, **Soma Banerjee**, Kamal K. Kar  
Pages 327-340  
Handbook of Nanocomposite Supercapacitor Materials I, Springer Series in Materials Science, Vol. 300, Springer Nature, Switzerland, 2020, ISBN 978-3-030-43009-2
15. Introduction to Liquid Crystalline Polymers  
**Soma Banerjee** and Kamal K. Kar  
S. Palsule (ed), Polymers and Polymeric Composites: A Reference Series,  
[https://doi.org/10.1007/978-3-642-37179-0\\_49-1](https://doi.org/10.1007/978-3-642-37179-0_49-1)  
Springer-Verlag GmbH Germany, part of Springer Nature 2020
16. Transition Metal Oxides as Electrode Materials for Supercapacitors.  
B. De, **Soma Banerjee**, K. D. Verma, T. Pal, P.K. Manna, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 04, page nox, Year: 2020, ISBN 978-3-030-52359-6.
17. Activated Carbon as Electrode Material for Supercapacitors.  
P. Sinha, **Soma Banerjee**, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 05, page nox, Year: 2020, ISBN 978-3-030-52359-6.
18. Transition Metal Oxide/Activated Carbon based Composites as Electrode Materials for Supercapacitors.  
P. Sinha, **Soma Banerjee**, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 06, page nox, Year: 2020, ISBN 978-3-030-52359-6.
19. Carbon Nanofiber as Electrode Material for Supercapacitors.  
B. De, **Soma Banerjee**, K. D. Verma, T. Pal, P.K. Manna, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 07, page nox, Year: 2020, ISBN 978-3-030-52359-6.
20. Transition Metal Oxide/Carbon Nanofiber Composites as Electrode Materials for Supercapacitors.  
B. De, **Soma Banerjee**, K. D. Verma, T. Pal, P.K. Manna, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 08, page nox, Year: 2020, ISBN 978-3-030-52359-6.
21. Carbon Nanotube as Electrode Materials for Supercapacitors.  
B. De, **Soma Banerjee**, K. D. Verma, T. Pal, P.K. Manna, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 09, page nox, Year: 2020, ISBN 978-3-030-52359-6.

22. Transition Metal Oxide/ Carbon Nanotube Composite as Electrode Materials for Supercapacitors.  
B. De, **Soma Banerjee**, K. D. Verma, T. Pal, A. Tyagi, K. D. Verma, P.K. Manna, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 10, page nox, Year: 2020, ISBN 978-3-030-52359-6.
23. Graphene/Reduced Graphene Oxide as Electrode Material for Supercapacitors.  
B. De, **Soma Banerjee**, T. Pal, K. D. Verma, P.K. Manna, K. K. Kar (2020)  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 11, page nox, Year: 2020, ISBN 978-3-030-52359-6.
24. Transition Metal Oxide/Graphene/Reduced Graphene Oxide Composites as Electrode Materials for Supercapacitors.  
B. De, P. Sinha, **Soma Banerjee**, T. Pal, K. D. Verma, A. Tyagi, P.K. Manna, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 12, page nox, Year: 2020, ISBN 978-3-030-52359-6.
25. Conducting Polymers as Electrode Materials for Supercapacitors.  
**Soma Banerjee**, and K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 13, page nox, Year: 2020, ISBN 978-3-030-52359-6.
26. Transition Metal Oxide/Electronically Conducting Polymer Composites as Electrode Material for Supercapacitors.  
B. De, **Soma Banerjee**, T. Pal, K. D. Verma, A. Tyagi, P.K. Manna, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 14, page nox, Year: 2020, ISBN 978-3-030-52359-6.
27. Transition Metal Oxide/Carbon/Electronically Conducting Polymer Based Ternary Composites as Electrode Materials for Supercapacitors.  
B. De, **Soma Banerjee**, T. Pal, K. D. Verma, A. Tyagi, P.K. Manna, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 15, page nox, Year: 2020, ISBN 978-3-030-52359-6.
28. Recent Trends in Supercapacitor Electrode Materials and Devices.  
P. Sinha, B. De, **Soma Banerjee**, K. D. Verma, T. Pal, P.K. Manna, K. K. Kar  
In: K. K. Kar (ed) Handbook of Nanocomposite Supercapacitor Materials II Performance. Springer Nature, Berlin, Heidelberg, Chapter 16, page nox, Year: 2020, ISBN 978-3-030-52359-6.



## 9. *Papers Presented in Conferences:*

### Poster Presentations:

1. **Soma Banerjee (Presenter)**, Subhomoy Das, Manas K. Ghorai, Kamal K. Kar, “Synthesis and Characterization of Polymer Electrolyte Membrane for Fuel Cell Applications”, CCM12, BARC, Mumbai.
2. **Soma Banerjee (Presenter)**, Kamal K. Kar, “Al<sup>3+</sup> Immobilized Phosphotungstic acid/Sulfonated Poly ether ether ketone Nanocomposite Membrane for Fuel Cell Application”, *Conference on Microscopy in Material Science and Biomimetic Technology (AMST), 2015, DMSRDE, Kanpur.*
3. **Soma Banerjee (Presenter)**, Kamal K. Kar, “Sulfonated Poly Ether Ketone/Polypyrrole/AlPO<sub>4</sub> Nanocomposite Polymer Electrolyte Membrane with Excellent Water Retention and Thermal Stability”, *National Conference on Carbon Materials 2015 (NCCM 2015), New Delhi.*
4. **Soma Banerjee (Presenter)** and Kamal K. Kar, “Synergistic effect of tungstophosphoric acid and aluminium phosphate nanoparticles on physicochemical properties of sulfonated poly ether ether ketone polymer electrolyte membrane”, *Proc. of the Intl. Conf. on Nanotechnology for Better Living, May 25th-29th 2016, Vol. 3, p. 168, doi:10.3850/978-981-09-7519-7nbl16-rps-168, NIT Srinagar.*
5. **Soma Banerjee (Presenter)** and Kamal K. Kar, “Thermogravimetric Analysis of Sulfonated poly ether ether ketone (SPEEK) Polymer Electrolyte Membrane”, *Fourth International Conf. on Nanotechnology for Better Living, April 06-07, 2019, IIT Kanpur.*

### Oral Presentation :

1. *Oral presentation on “A Comparative Evaluation on Dense and Porous Sulfonated Poly ether ether ketone Membranes for Low Temperature Fuel Cells, OP12”, in National Conference on Innovative Development in Chemical Technology (IDCT-2021), 19th-20th March, 2021,*  
**Presenter: Soma Banerjee, Co-authors: Sachin Chauhan and Kamal K Kar.**
2. *Oral presentation on “Development of Polymer Electrolyte Membranes For Fuel Cell Application”, Research Scholar Day 2016 (MSRSD-2016), Materials Science Programme, IIT Kanpur, 12th March, 2016.*  
**Presenter : Soma Banerjee**

## 10. **Co-Editor**

1. *Nanotechnology for better living Theme: Technological Advancements of Polymer Composites; Editors: Kamal K Kar, **Soma Banerjee**, Bhoomika Yadav, Research Publishing Services, Singapore, Vol-4, No-1, Pages: 260, Year: 2019*

## ***11. Conference & Courses Organized:***

- ❖ **International conference** on Carbon Nanotechnology Potential and Challenges, Carbon 10, December 15-17, 2010, **IIT Kanpur**
- ❖ **Quality Improvement Programme (QIP) Course** in Emerging trends in carbon nanotechnology, December 13- 17, 2010, **IIT Kanpur**
- ❖ **QIP Course** in Emerging Trends in Carbon Nanotubes, November 07- 12, 2011, **IIT Kanpur**
- ❖ **QIP Course** in Advanced nanoengineering materials, February 18-22, 2013, **IIT Kanpur**
- ❖ **QIP Course** in Nanostructured Carbon: Fuel Cell Applications, September 30-October 04, 2013, **IIT Kanpur**

## ***12. Project Work:***

### ***1) M. Tech. Project work***

Research project on “**Mechanical and Fracture Analysis of Mineral Filled Polypropylene Composites**” at *Haldia Petrochemicals Limited*, **Duration 10 months**

### ***2) B. Tech. Project work***

Research project on “**Synthesis of Semi-IPN from PVA & HEMA and its Applications for Dehydration of Dioxane**”

### ***3) Industrial Training Experience***

Industrial training at *Berger Paints India Ltd.* (Howrah) as a part of B. Tech. Course- **Duration 2 Months**

## ***13. Instruments used in Research Works***

- ❖ Differential Scanning Calorimeter (DSC)
- ❖ Thermo Gravimetric Analyzer (TGA)
- ❖ X-ray Diffraction (XRD)
- ❖ Scanning Electron Microscope (SEM) and Elemental mapping
- ❖ Melt Flow Index Instrument
- ❖ Universal Tensile Tester
- ❖ Izod & Charpy Impact Tester
- ❖ Dart Impact Tester
- ❖ HDT & VSP Analyzer
- ❖ Laser Particle Size Analyzer
- ❖ Nuclear Magnetic Resonance spectroscopy
- ❖ Fourier transform Infra-red spectroscopy
- ❖ UV-*vis* spectroscopy
- ❖ AC-impedance
- ❖ CHN analysis

***Declaration:***

**I hereby declare that the above mentioned information are correct, true and complete to the best of my knowledge and belief.**

Date:

Place: Kanpur

***(Soma Banerjee)***