

Dr. Mamata Pradhan

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Profile Summary:

- **Research Experience:** Development of innovative colloidal systems using different additives for functional coatings (Anti-reflective, Hydrophobic, Anti-corrosive, Transparent Scratch-resistant and Lubricious composite etc.), Encapsulation of active moiety into micro-nano containers via Emulsion Polymerization, Multiple emulsions, Wax-stabilized water-in-oil emulsions and their behavior in the pipeline, Synthesis of self-designed Nano- particulates, Development of stable highly viscous slurries and their processing to produce dense/porous ceramic components, Microstructure and property correlations, Interpretation of complex interactions of additives in a colloidal system through Rheological study.
- Demonstrated capability as a **Technical lead** at **TCS R&D (TRDDC), Pune** and **Dow Chemical International, Pune**.
- Demonstrated capability as a **Team player** at **TCS R&D (TRDDC), Pune**.
- Application/method development for standardization and validation of various developed materials and processes using Particle size analyzer, Zeta Sizer, Surface area measurement by BET, Mercury Porosimetry, Contact angle measurement, Pulse field-NMR, Stress-strain controlled Rheometer, Confocal Microscope / Polarized microscope / SEM / TEM/ AFM, Universal Testing Machine (UTM), Micro-hardness Tester, Nano-Indenter, UV-visible spectroscopy, XPS, AES, FT-IR, DSC, DT-TGA, XRD etc.
- Experience in evaluating surfactants, dispersants, emulsifiers, binders, polymers and other additives for the new product development.
- Track record of excellent experimental performance, self-driven and determination to overcome complex technical challenges.

Organizational Experience:

- **May 2017 – May 2021: Principal Investigator (PI) under women scientist scheme (WOS-A, DST, India) at IIT, Bombay (Sanctioned Grant: 27 Lacs)**
- March 2014 – March 2015: Institute Post-Doctoral Fellow at **IIT, Bombay, Mumbai**
- Sep. 2011 – March 2012: **Senior Chemist at The Dow Chemical Company, Pune**
- June 2005 – Aug. 2011: **Scientist at Tata Research Development and Design Centre (TRDDC), TCS, Pune**
- Oct. 2008 – March 2010: Post-Doctoral fellow at Department of Chemistry & Biology, **Ryerson University, Toronto, Canada**.

Education:

- Ph. D. (Materials Science): *June 2001 – May 2005, IIT Kharagpur*

Thesis: Processing, microstructure and properties (mechanical, air permeability) of porous alumina produced by direct foaming of alumina slurries

Advisor: **Prof. Parag Bhargava, Materials Science Centre, IIT Kharagpur**

- M. Sc. (Chemistry): 1998, Ravenshaw College (Utkal University, Odisha) (72.2 %)
- B. Sc. (Chemistry): 1996, Utkal University Odisha (76 %)

M. Pradhan

National level Fellowship:

- CSIR -Senior Research Fellowship, 2004
- National Eligibility Test (CSIR) for lectureship, 2000
- Graduate Aptitude Test in Engineering (GATE), 1999, 2000

Industrial R & D Experience

SENIOR CHEMIST: Dow Chemical International Pune, India

09/2011 – 03/2012

- Responsible as a **Technical lead** to submit new proposals with innovative ideas and approaches in the aligned direction of the R & D unit.
- Work closely with R & D Formulation manager and technical application services team to develop a compliant paint and coating formulation as per customer brief.
- Identification, development of new potential products and technologies through innovative use of materials and processes.

Internal Projects:

- Organic-inorganic hybrid Anticorrosive Coatings with low VOC through Pickering emulsion polymerization of Acrylic monomer
- Development of Antimicrobial Paper coatings using Hypod suspension
- Stability of HYPOD suspension
- Synthesis of Al-P flame retardants with controlled size

SCIENTIST: Tata Research Development & Design Centre (TRDDC), TCS, Pune, India

06/2005 – 08/2011

- Demonstrated capability to generate funding for the research group.
- Demonstrated capability as a **Technical lead** for developing, delivering compliant formulations as per customer brief.
- Responsible for submitting new proposals with innovative ideas and approaches in the aligned direction of the R & D unit.
- Work closely with the R & D team and Business manager to meet the deliverables scheduled in time.

Sponsored Projects:

- Development of a **specific formulation for coatings on fabrics for nuclear, biological, chemical warfare protection applications** (Project Approved, Funding Agency: A unit of Govt. of India).
- Development of a **customer-designed formulation for heat resistant lubricious composite coatings of a surgical device** (Project funded by an MNC, USA).
- Development of a **customer-designed scratch-resistant clear coat formulation from ESP dust** (Industrial waste) for automotive applications (Project funded by an MNC, USA).
- Production of Alumina nanoparticles in aqueous medium by high energy wet attrition method (Project funded by an MNC, USA).

- Flowability of Aluminium trihydrate powders with use of organic & Inorganic binders (Project funded by an MNC, USA).

Internal Projects:

- Effect of nanoparticles dispersion on the sintering behavior and mechanical properties of nanostructured components (*Published in Ceramic International Journal*).
- A feasibility study on the production of transparent Alumina from ESP Dust (Industrial waste).
- Effect of consolidation techniques on packing density and sintering behavior of Alumina.
- A Feasibility study on preparation of nano alumina/polymer composite produced from ESP dust.

National and International Academic Experience

Research Scientist: MEMS Department IIT, Bombay 17/03/2014 – Present

- Responsible for securing my own grant for my research.
- Responsible for managing the project and publishing results at National and International levels.

Projects:

- **Antireflective and self-cleaning** coatings on Solar Cells. (Sponsored by WOS-A, DST).
- **GO stabilized Oil-in-Water emulsion and its polymerization to encapsulate 8-HQ** via emulsion polymerization method.
- Continuous production of Ceramic Foam

Post-Doctoral fellow: Dept. of Chem. & Bio., Ryerson University, Toronto, Canada. Oct. 2008 – March 2010

- Stability behavior of **Wax-Stabilized Water-in-oil emulsions** in long term
- **Flow behavior of Wax stabilized water-in-oil emulsions** in 15-meter lab-scale flow loop by mimicking sea bed condition
- A one-step process for the formation of **oil-in-water-in-oil double emulsion** using a single surfactant

June 2001 – May 2005: Ph.D. work (Materials Science), I .I.T, Kharagpur

Thesis: Processing, microstructure and properties (mechanical, air permeability) of porous alumina produced by direct foaming of sucrose and soapnut based alumina slurries

List of Patents & Publications:

Patents: 02

- **M. Pradhan**, P. Bhargava, “Highly porous ceramic or metallic material and simple environment-friendly process for fabrication of the same,” Indian Patent No. 206908 dt. 8/9/2003 (Grant date 16/05/2007).
- S. Dhara, **M. Pradhan** and P. Bhargava, “A composition for forming porous bodies in particular, ceramic and metal foams, and a process for the preparation thereof”, Indian Patent No. 203231 dt. 27/5/2002 (Grant date 09/03/2007).

Total Publications: 16 (12 Journals and 4 Proceedings)

Publications:

1. **M. Pradhan**, A robust method for the development of mechanically, thermally stable anti reflective and self-cleaning coatings through in-situ formation of hierarchical raspberry-like mesoporous nanoparticles, J. Indus. Eng.&Chem. (Accepted) (Sep, 2021).
2. S. Daradmare, **M. Pradhan**, V. S. Rajaa, S. Parida, “Epoxy – 8-HQ@PS/GO composite coatings: size effect of fillers on the self-healing and passive protection” Progress in Organic Coatings ,158 (106352), (2021).
3. S. Daradmare, **M. Pradhan**, V. S. Rajaa, S. Parida, “Parametric studies of formation and morphology of sub-micron sized GO stabilized PS\GO containers encapsulating 8-HQ”, Polymer, 118, 116 – 126, (2017)
4. S. Daradmare, **M. Pradhan**, V. S. Rajaa, S. Parida “Encapsulating 8- Hydroxyquinoline in Graphene Oxide Stabilized Polystyrene Containers and its Anti- Corrosion Performance”, Journal of Materials Science, Vol. 51 (22), 10262 -10277, (2016).
5. S. Ghosh, **M. Pradhan**, Tejas Patel; Samira Haj-shafiei, D. Rousseau, “Long-term stability of crystal-stabilized water-in-oil emulsions”, J. Colloid and Interface Science, Vol. 460, 247-257, (2015).
6. **M. Pradhan**, D. Rousseau, “A one step process for the formation of O/W/O double emulsion using a single surfactant”, J. Colloid and Interface Science, Vol. 386 [1], 398-404 (2012).
7. **M. Pradhan**, P.C. Kapur and Pradip, “Effect of Powder Dispersion on Sintering Behavior and Mechanical Properties of Nanostructured 3Y-TZP Ceramics,” Ceramic International Vol. 38 [4], 2835–2843 (2012).
8. **M. Pradhan**, P. Bhargava, “Defect and microstructural evolution during drying of soapnut based alumina foams,” Journal of the European Ceramic Society, Vol. 28 [16], 3049-3057 (2008).
9. S. Dhara, **M. Pradhan**, D. Ghosh, P. Bhargava, “Nature inspired novel processing routes for ceramic foams,” Advances in Applied Ceramics, Vol. 104 [1] 9-21 (2005) (**Invited article**).
10. **M. Pradhan** and P. Bhargava, “Influence of sucrose addition on rheology of alumina slurries dispersed with a polyacrylate dispersant,” Journal of the American Ceramic Society, Vol 88 [4], 833-838, (2005).
11. **M. Pradhan**, P. Bhargava, “Effect of sucrose addition on the fabrication of ceramic foam from aqueous slurries,” J. American Ceramic Society, 88 [1] 216 - 218 (2005).

12.S. Dhara, R. K. Kamboj, **M. Pradhan** and P. Bhargava, “Shape forming of ceramics via gelcasting of aqueous particulate slurries”, Bull. Mater. Sci., 25 [6] 565-568 (2002).

Conference Proceeding: 4

- **M. Pradhan**, P. C. Kapur, and Pradip, "Colloidal processing of zirconia nanoparticles and production of sintered nanostructured ceramics," Proceedings, 3rd Asian Particle Technology Symposium, APT 2007, Beijing, China, 2007, Vol. 2, pp 564-573.
- **M. Pradhan** and P. Bhargava, “Tailoring Porosity and Pore Characteristics in Oxide Ceramic Foams through Controlled Processing”, Transactions of the Indian Ceramic Society, Vol. 67 [3] 101 – 117 (2008).
- **M. Pradhan** and P. Bhargava, “Effect of additives on ceramic foam microstructure processed by direct foaming of aqueous slurries”, Transactions of the Indian Ceramic Society, Vol. 63 [3] 151 – 154 (2004).
- S. Dhara, **M. Pradhan**, P. Bhargava, “Critical aspects in shape forming of ceramics via gelcasting of aqueous particulate slurries”, Proc. of the Intl. Conf. on Advances in Materials and Materials Processing, Pub. Tata McGraw Hill, Ed. by N. Chakraborti and U.K. Chatterjee, pp. 202 – 206, IIT Kharagpur (2002).

Conference Presentation: 15

References: Available on Request.