

Scientist-ARCI |

PDF-ARCI | Ph.D. – IITM | M.Tech. – IITK | Best Paper, Poster Awardee | Materials Scientist

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## EDUCATION

- Ph.D.** – Metallurgical and Materials Engineering | 2013-2018  
Indian Institute of Technology Madras | Chennai | CGPA:8.5/10  
Thesis: Synthesis, functional properties, and jetting behavior of pure and doped zinc oxide inks for printed applications
- M.Tech.** – Materials Science Programme | 2008-2010  
Indian Institute of Technology Kanpur | CGPA-7.45/10  
Thesis: Structural and impedance spectroscopic studies on alio & Isovalent doped hydroxyapatite
- M.Sc.** – Physics (Electronics) | 2005-2007  
• Ch. Charan Singh University Meerut | Percent – 69.8/100

## AWARDS/Fellowships

- **Women Scientist (WoS-A)-DST**
- **Institute Research Award** - IIT Madras
- **Institute Pre-doctoral Fellowship** - IIT Madras
- **Best poster award** - E-MRS spring, France
- **International Travel Grant** - SERB, India
- **Best paper award** - MME department, IIT Madras
- **Qualified CSIR-JRF & NET, GATE and JEST**
- **Received Junior Research Fellowship** for M.Tech
- **Topper** – B.Sc, M.B. Degree college, Dadri, U.P. – 10<sup>th</sup> class, Vedic Kanya Inter College, U.P.

## DOCTOR OF PHILOSOPHY – Indian Institute of Technology Madras

July 2013-May 2018

I have extensively been involved in synthesizing pure **n-type ZnO** and **p-type Mn doped ZnO (MZO)** semiconductor inks for printed applications to fabricate the p-n diode for LED device fabrication. In addition, I have also prepared Al-doped ZnO (AZO) for transparent electrode application. The **MZO and AZO nanoparticles were developed by a novel top-down milling approach**, which were used for the preparation of inks, **showing excellent jettability and stability**. A top-down physical synthesis approach was used to prepare both pure and doped ZnO based inks and the rheological properties of the ink were related to the stability and printability of the ink. It was found that controlling the amount of manganese dopant and the synthesis temperature led to the desired **band gap of 2.45 eV**. The developed AZO showed **very good figure of merit**, making this material feasible to use as transparent conducting electrode. Also, for AZO, band gap was red shifted which was attributed to the increasing concentration of shallow defects.

## EXPERIENCE

### Lead Scientist–Ace Lithium Pvt. Ltd. (Ace Green Recycling Inc.)

June 2022 – June 2023

<b>Roles &amp; Responsibilities</b>	<ul style="list-style-type: none"><li>• Project lead for “developing a one-step method for recovering NMC from the spent NMC batteries leached solution followed by synthesis of NMC hydroxides without using any N<sub>2</sub> gas/controlled environment conditions”.</li><li>• Project lead for the “selective Li-extraction from spent NMC battery black mass followed by industrial grade Li<sub>2</sub>CO<sub>3</sub> synthesis using homogeneous and heterogeneous crystallization methods”</li><li>• Problem identification and troubleshooting conceptual engineering issues; collecting and analyzing data; Report compilation on basic process engineering experiments</li><li>• Documentation for products, presentations, and technical reports</li><li>• Supervising and training the team members for designing innovative processes</li></ul>
<b>Achievements</b>	<ul style="list-style-type: none"><li>• Designed and developed an eco-friendly, low cost and scalable process for 90% and above extraction of Ni-Mn-Co rich solution from the spent NMC battery leach solution.</li><li>• Developed an innovative and inexpensive method for NMC hydroxides synthesis.</li><li>• A complete scheme starting with ~92% Li-extraction to 98% pure Li<sub>2</sub>CO<sub>3</sub> synthesis was successfully demonstrated.</li></ul>

### Post-doctoral Fellow – International Advanced Research Centre for Powder Metallurgy and New Materials

Nov 2019-Nov 2021

<b>Roles &amp; Responsibilities</b>	<ul style="list-style-type: none"><li>• Responsible for leading and executing the project of developing compatible and high-performance anode electrode for sodium-ion batteries. Design of experiment involves a novel approach for material development, planning the electrode fabrication and verifying the result with structural and electrochemical characterization techniques.</li><li>• Co-lead the project of developing non-aqueous electrolytes where every fine detail was recorded to get the desired and compatible electrolyte for both cathode and anode used in SIBs.</li><li>• Ensuring data quality, instruments maintenance and raising indents, purchase order for procuring materials.</li></ul>
<b>Achievements</b>	<ul style="list-style-type: none"><li>✓ Developed cathode, anode electrodes and non-aqueous electrolytes for sodium-ion batteries</li><li>✓ Tackled fundamental issues and fabricated excellent electrochemical performing anode material</li></ul>

### Lecturer – Rajiv Gandhi University of Knowledge and Technologies

Nov 2011-July 2013

<b>Roles &amp; Responsibilities</b>	<ul style="list-style-type: none"><li>• Taught engineering physics and materials science courses to the UG students</li><li>• Lab-in-charge for materials testing lab: UTS, impact test, Hall effect, four probe, photoelectric effect</li></ul>
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### Subject Matter Expert – Winzest Edutech Pvt. Ltd.

Aug 2010-Oct 2011

**Roles & Responsibilities**

- Providing research content on Engineering physics, Electronic Measurement & Instrumentation and Electro-Magnetic Theory and Transmission Lines.
- Responsibilities of doing Quality check on the reports processed by the peers in the team.

**Achievements**

- ✓ Developed a complete e-learning content for engineering physics

**REFEREED PUBLICATIONS**

- Sonia sharma, Venkatesh Manchala, R. Gopalan, T. N. Rao and Bijoy Das et. al., Quasi-diffusion controlled high rate sodium-ion storage performance of flame pyrolysis derived spherical hard carbon, Carbon, **226**, 119158 (2024).
- Manchala Venkatesh, G. Sudha Priyanga, Sonia Sharma, P. Laxman Mani Kanta, Tiju Thomas, R. Gopalan, Bijoy Das, "Effect of dopants and microstructure on the electrochemical cyclic stability of layered P2-type Na<sub>0.67</sub>MnO<sub>2</sub> prepared by different chemical routes: An experimental and theoretical study", Ceramic International, **49**, 6654 (2023).
- Sonia Sharma, Meghna Narayanan, Ravi Gautam, Raghavan Gopalan, and P. Swaminathan, "Effect of processing route on the structural and functional properties of manganese doped zinc oxide", Mater.Chem. Phys. **261**, 124206 (2021).
- Sonia Sharma, Sumukh S Pande, and P. Swaminathan, Top-down synthesis of zinc oxide-based inks for inkjet printing, RSC Adv., **7**, 39411 (2017).
- Sonia Sharma, Raghavendar Bayikadi, and P. Swaminathan, Spark plasma sintering route to synthesize aluminium doped zinc oxide, RSC Adv., **6**, 86586 (2016).
- Sonia Sharma, Pranith Ramesh, and P. Swaminathan, Reduction in band gap of Manganese doped Zinc Oxide, J. Elec. Matls, **44**, 4710 (2015).

**CONFERENCES**

1. Sonia Sharma, Sumukh S Pande, and P. Swaminathan, "Physical synthesis and jetting behaviour of metal oxide-based inks for printed electronics" European Materials Research Society (E-MRS), May – 2017.
2. Sonia Sharma, Bankala Shashi Kiran, Krishna Kumar, and P. Swaminathan, "Transparent conducting electrode fabrication using a combination of spin coating and thermal evaporation" 9<sup>th</sup> International Conference on Materials for Advanced Technologies (ICMAT-2017), June – 2017.
3. Sonia Sharma, and P. Swaminathan, "Printed electroluminescent devices based on metal oxides", Research Scholars Day (RSD) IIT Madras, April – 2017.
4. Bankala Shashi Kiran, Karthick Mani, Sonia Sharma, and P. Swaminathan, "Functional properties of spin coated Indium Tin Oxide thin films", International Symposium for Research Scholars (ISRS-2016), Dec – 2016.
5. Sonia Sharma, Sumukh S Pande, and P. Swaminathan, "Physical route for synthesis of metal oxide inks for printed electronics", National Metallurgists Day (NMD) Annual Technical Meeting (ATM) 2015, Nov – 2015.
6. Sudharsan, Sonia Sharma, and P. Swaminathan, "Electrical conductivity of aluminium doped zinc oxide fabricated using spark plasma sintering process", International Symposium for Research Scholars (ISRS-2014), Dec – 2014.
7. Sonia Sharma, Pranith Ramesh, and P. Swaminathan, "Optical properties of transition metal doped ZnO", National Metallurgists Day (NMD) Annual Technical Meeting (ATM) 2014, Nov – 2014.