

Dr. Kaliyan Hembram, B.E., Ph.D.

Scientist-E

Centre for Nanomaterials

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Date of birth: 04-06-1980

Education Background:

- Ph.D. (Metallurgical Engineering and Materials Science), IIT-Bombay, Mumbai (2016)
Thesis title: Development and investigation of high performance varistors from doped ZnO nanopowders. Guides: Prof. A.R. Kulkarni, Prof. Raman R. Srinivasa and Dr. T.N.Rao
- B.E. (Metallurgical and Materials Engineering), MREC/MNIT, Jaipur (2002)
Thesis title: Optimization of heat treatment cycle of high chromium cast iron, Guide: Late Prof. RK Yadav

Work Experience:

- Scientist-E, ARCI, Hyderabad: 2017- till date
- Scientist-D, ARCI, Hyderabad: 2012- 2017
- Scientist-C, ARCI, Hyderabad: 2007-2012
- Scientist-B, ARCI, Hyderabad: 2003-2007
- Engineer, IRC Engineering Services Pvt. Ltd, New Delhi: 2002-2003

Research Interest:

- Biodegradable metal implants
- Self-disinfection of fabrics using nanotechnology
- ZnO Varistor
- Synthesis (FSP,EEW,SCS, HEBM) and Characterization of nanopowders
- Li-Ion Battery (Cathode, Anode and Solid Electrolytes)
- Photo-catalysis
- Synthesis-structure-property correlations in materials

Total Citation: 375, H index: 9, i10-index: 9 (Google Scholar)

List of Publications:

1. **K. Hembram**, T. N. Rao, R. S. Srinivasa and A. R. Kulkarni, CaO doped ZnO–Bi₂O₃ varistors: Grain growth mechanism, structure and electrical properties, *Ceramic International*, 47,1, 1229-1237 (2021).
2. D. Spandana, Hemin Desai, D. Chakravarthy, R. Vijay and **K. Hembram**, Fabrication of a Biodegradable Fe-Mn-Si Alloy by Field Assisted Sintering, *Advanced Powder Technology*, 31, 12, 4577-4584, 2020.
3. **K. Hembram**, T. N. Rao, M. Ramakrishna, R. S. Srinivasa and A. R. Kulkarni, Influence of CaO doping on Phase, Microstructure, Electrical and Dielectric Properties of ZnO Varistors, *Journal of Alloy and Compounds*, 817, 152700 (2020).
4. **K. Hembram**, T. N. Rao, M. Ramakrishna, R. S. Srinivasa and A. R. Kulkarni, A Novel Economical Grain Boundary Ultra-High Performance ZnO Varistor with Lesser Dopants, *Journal of the European Ceramic Society*, 38 (15) 5021-5029 2018 (In press)
5. M. Gririraj, K. Murugan K., N. K. Sahu, **K. Hembram**, High performance multi-layer varistor (MLV) from doped ZnO nanopowders by water based tape casting: Rheology, sintering, microstructure and properties, *Ceramic International*, 44, 7837-43 (2018).
6. Development of a novel carbon-coating strategy for producing core-shell structured carbon coated LiFePO₄ for an improved Li-ion battery performance, PM Pratheeksha, EH Mohan, BV Sarada, M Ramakrishna, **K Hembram**, T. N. Rao and S. Anandan, *Physical Chemistry Chemical Physics* 19 (1), 175-188 (2017).
7. **K.Hembram**, T.N.Rao, R.S.Srinivasa and A.R.Kulkarni, High performance varistor made from doped ZnO nanopowders by pilot-scale flame spray pyrolyser: sintering, microstructure and properties, *Journal of the European Ceramic Society*, 35, 3535-44, (2015).
8. R. Kumar, D. Navadeepthy, **K. Hembram**, T. N. Rao and S. Anandan, Visible-light-induced photocatalytic disinfection of e-coli pathogens with Fe³⁺-grafted ZnO nanoparticles, *Energy and Environmental Focus*, 4,1-7 (2015).
9. A. Sangeetha, L. Samyuktha, AVN Swamy, A Kapley, K Jamil, T.N. Rao and **K. Hembram**, Biological interactions in vitro of zinc oxide nanoparticles of different characteristics, *IOP, Materials Research Express* 1 035041(2014).
10. R. Kumar, S. Anandan, **K. Hembram**, and T. N. Rao, Efficient ZnO-Based Visible-Light-Driven Photocatalyst for Antibacterial Applications, *ACS Applied Materials & Interfaces*, 6 13138–13148 (2014).
11. **K. Hembram**, D. Sivaprahasam, K.Wagner and T.N. Rao, Large-scale manufacture of ZnO Nanorods by Flame Spray Pyrolysis, *Journal of Nanoparticle Research*,15, 1-11(2013).
12. **K. Hembram**, D. Sivaprahasam and T.N. Rao, Combustion synthesis of doped nanocrystalline ZnO powders for varistors applications, *Journal of the European Ceramic Society* 31 1905–1913 (2011). Listed in **hottest 25 articles in Elsevier**, *Material Science*, *Journal of the European Ceramic Society*, April to June 2011.
13. R. Subasri, M. Asha, **K. Hembram**, G.V.N. Rao and T.N. Rao, Microwave Sintering of Doped Nanocrystalline ZnO and Characterization for Varistor Applications, *Material chemistry and physics* Volume 115, Issues 2-3, 15, Pages 677-684 (2009).
14. **K. Hembram**, R.Vijay, Y.S. Rao and T.N. Rao, Doped nanocrystalline ZnO powder for non-linear resistor application by spray pyrolysis method, *Journal of Nanoscience and Nanotechnology* 9, 4376-4382 (2009).

List of Patents:

1. Improved composition and method of preparation of high performance ZnO varistors, **K. Hembram**, A.R. Kulkanri, R. S. Srinivasa and T.N.Rao, Indian Patent Application No. **339,072 (2020)**.
2. An improved method for producing ZnO nanorod, **K. Hembram**, D. Sivaprahasam and T.N.Rao, Indian Patent Indian patent No. **293775 (2018)**.
3. An improved process for the preparation doped ZnO nanopowder useful for the preparation of Varistor and an improved process for the preparation for Varistor employing the said nanopowder" **K. Hembram**, T. N. Rao and R. Sundaresan, Indian patent No. **254913 (2013)**.

List of Lecture Delivered:

1. Presented a paper "Large Scale Manufacture of Doped ZnO Nanopowders for Varistor Applications by Top-down and Bottom-up Approach" in Regional Conference of young scientist on the topic " Nanoscience and Nanomaterials, during February 18-20, 2015, JNCASR, Bangalore, India.
2. Presented a paper on " Shape Control Synthesis of ZnO Nanopowders and for Varistor Applications by Flame Spray Pyrolysis," in MRS Fall Meeting and Exhibitions during 30th Nov.-5th Dec 2014, Boston, USA.
3. Presented paper on " Nanotechnology in Energy" in Asia Nanotech Camp 2012, Beijing, China.
4. Presented a paper on " Combustion synthesis of doped ZnO nanopowder for varistors applications, in International contest of applications in nano-micro technology(I-CAN) 2012, Beijing, China
5. Presented paper on "Synthesis and Characterization of Catalyst free Bulk Pure ZnO Nanorods by Flame Spray Pyrolysis" at International Conference Nanoscience and Technology(ICONSAT), January 20-23, 2012, organized by ARCI, Hyderabad, India.
6. Presented paper on "Doped nanocrystalline ZnO powder for Varistor applications by spray pyrolysis method" at 2nd International meeting on development in materials, processes and applications of nanotechnology (MPA-2008) held at University of Cambridge, Cambridge, UK.
7. Presented poster paper on " Nano alumina synthesis by electrical explosion of wire" at National Seminar on Powder Metallurgy 2007, Hyderabad, India.
8. Presented poster paper on "Doped nanocrystalline ZnO powder for Varistor application" at 6th International conference on nanoscience and nanotechnology (Nano-2006), IISc, Bangalore, India
9. Presented poster paper on "Interrelationship between microstructure and dielectric and electrical properties in ZnO" at International conference on Nano-materials for Electronics (ICNME-2006), Pune, India.
10. Presented poster paper on " Nano alumina synthesis by electrical explosion of wire" at International Symposium on Frontlines in Design of Materials (FMD-2005), IIT Madras, Chennai, India.

Affiliation to Professional Societies:

1. Life Member of Indian Institute of Metal, India
2. Life Member of Material Research Society of India
3. Member of American Ceramic Society, USA
4. Member of Material Research Society, USA
5. Life member of Powder Metallurgy Association of India
6. Member of Indian Ceramic Society, India

Awards & Honors:

1. One paper (K. Hembram et al) is listed in hottest 25 articles in Elsevier, Material Science, Journal of the European Ceramic Society, April to June 2011.
2. Best poster contribution award at International contest of applications in nano-micro technology(I-CAN) 2012, Beijing, China.
3. Golden best presentation award at Asia Nanotech Camp 2012, Beijing, China.

Reviewer for International Journals:

1. Journal of Nanoparticle Research, Springer; **Applied Catalysis B: Environmental**, Elsevier ;Ceramic International, Elsevier; **Journals of Alloys and Compounds, Elsevier**,Journals of Electronics Ceramics, Springer,Materials Research Express, IOP,UK;Journal of Electronic Materials, Springer;Journals of Advanced Ceramics, Springer;Advanced Powder Technology, Elsevier;Journal of Nanoscience and Nanotechnology, American Scientific Publisher;International Journal of Physical Sciences, Academic Journals ;**Nanotechnology**, IOP;**Journals of the American Ceramic Society**, Wiley; Materials Letter, Springer

Projects/Products Delivered:

S.N.	Name of Projects	Cost of the Project (Rs.)	Sponsored Agencies	Remarks
1.	Development and supply of nano-ZnO based Varistor	4.9L	BHEL, Hyderabad	PI
2.	Nanomission	900L	DST, Govt. of India	Member of the group
3.	Development of Multilayered/Thick film Varistors using doped ZnO nanopowder for Automotive Applications	47.8 L	SERB,DST, Govt. of India	PI
4.	Product and Supply of carbon coated LiFePO ₄ , Scale-up of the process of	10L	NSTL, DRDO	Co-PI

	Nb-doped LiFePO ₄ and characterization of Li-ion battery materials			
5.	Design and development of small scale FSP unit	-	In-house	PI
6.	Synthesis and development of high performance varistors from doped ZnO nanopowders	-	In-house	PI
7.	Development of solid electrolytes for Li-ion battery	-	In-House	PI
8.	Development Fe-Mn and Zn-Cu-Mg alloy for Biodegradable Implant	-	In-House	PI
9.	Technology Research Center(TRC) for alternative energy materials	98Cr	DST, Govt. of India	Member of the group
10	Development of self-disinfection nanoparticles and eletrospun coating on face masks and medical suits for combating COVID-19	23 L	Nanomission,DST	Co-PI