

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

**Scientist-F**

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), MNIT, Jaipur (2002)  
*Thesis title: Optimization of heat treatment cycle of high chromium cast iron, Guide: Late Prof. RK Yadav*

**Work Experience:**

- Scientist-F, ARCI, Hyderabad: 2022- till date
- Scientist-E, ARCI, Hyderabad: 2017- 2022
- 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
- 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: 510, H index: 11, i10-index: 11 ( Google Scholar)**

**List of Publications:**

1. **K. Hembram**, P.Haripriya, N.Sneha, B.V. Sarada, H.H. Krishnan and T. N. Rao, Synthesis of ceramic-metal nanocomposites for developing self-disinfecting fabrics against SARS-CoV-2 (**2023, In preparation**)
2. H. Kumar, S.Dutta, R.Vijay and **K. Hembram**, Ultra low degradation and excellent biocompatible Mg-Zn-Zr biodegradable alloy, Corrosion Science ( **2023, In preparation**)
3. Giri K, **Hembram K**, Tadge P and Ray SA, Comprehensive review on the tape casting of ceramic nanocomposite, Smart Green Connected Societies, Vol. 1 No. 01 (2021)
4. **K. Hembram**, T. N. Rao, R. S. Srinivasa and A. R. Kulkarni, CaO doped ZnO–Bi<sub>2</sub>O<sub>3</sub> varistors: Grain growth mechanism, structure and electrical properties, Ceramic International, 47,1, 1229-1237 (2021).
5. 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.
6. **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).
7. **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)
8. 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).
9. Development of a novel carbon-coating strategy for producing core-shell structured carbon coated LiFePO<sub>4</sub> 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).
10. **K.Hembram**, T.N.Rao, R.S.Srinivasa and A.R.Kulkanri, 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).
11. R. Kumar, D. Navadeepthy, **K. Hembram**, T. N. Rao and S. Anandan, Visible-light-induced photocatalytic disinfection of e-coli pathogens with Fe<sup>3+</sup>-grafted ZnO nanoparticles, Energy and Environmental Focus, 4,1-7 (2015).
12. 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).
13. 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).

14. **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).
15. **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.
16. 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).
17. **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).

#### **Media articles**

18. **Hembram et al.**, ARCI scientists develop next-generation biodegradable metal implants, 16-May-2020
19. **Hembram et al.**, Scientists develop self-disinfecting, biodegradable face masks to combat COVID-19, 04 February 2022

#### **List of Patents:**

1. Improved composition and method of preparation of high performance ZnO varistors, **K. Hembram**, A.R. Kulkarni, 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)**.
4. H. Kumar, S. Dutta, R. Vijay and **K. Hembram**, Improved method of preparation of biodegradable Mg-Zn-Zr alloys with superior degradation, biocompatibility and mechanical properties (in preparation)

#### **List of Lecture Delivered:**

1. Delivered an invited lecture on “Synthesis of Nanopowders by Flame Spray Pyrolysis for Different Applications: Laboratory to Pilot Scale” Inter-University National Research & Innovation Festival, Organized by Rabindranath Tagore University, Bhopal, 25-26 March, 2022
2. Delivered talk on “Influence of Zr addition on Microstructure, Mechanical properties and Degradation of Biodegradable Mg-Zn alloys, during 76th ATM-AGM held on 14-16th November 2022 at Ramoji Film City, Hyderabad
3. 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.

4. 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.
5. Presented paper on “ Nanotechnology in Energy” in Asia Nanotech Camp 2012, Beijing, China.
6. 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
7. 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.
8. 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.
9. Presented poster paper on “ Nano alumina synthesis by electrical explosion of wire” at National Seminar on Powder Metallurgy 2007, Hyderabad, India.
10. Presented poster paper on “Doped nanocrystalline ZnO powder for Varistor application” at 6th International conference on nanoscience and nanotechnology ( Nano-2006), IISc, Bangalore, India
11. 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.
12. 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

#### **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
2. Applied Catalysis B: Environmental, Elsevier
3. Ceramic International, Elsevier
4. Journals of Alloys and Compounds, Elsevier
5. Journals of Electronics Ceramics, Springer
6. Materials Research Express, IOP
7. Journals of Advanced Ceramics, Springer
8. Journal of Nanoscience and Nanotechnology, American Scientific Publisher
9. International Journal of Physical Sciences, Academic Journals
10. Nanotechnology, IOP
11. Bulletin of Materials Science
12. Transactions of the Indian Institute of Metals
13. Advanced Powder Technology, Elsevier
14. Journal of the American Ceramic Society

**Organized Conference/Workshop****Projects/Products Delivered:**

S.N.	Name of Projects	Cost of the Project Lakhs	Sponsored Agencies	Remarks
1.	Development and supply of nano-ZnO based Varistor	4.9	BHEL, Hyderabad	PI
2.	Nanomission	900	DST, Govt. of India	Member of the group
3.	Development of Multilayered/Thick film Varistors using doped ZnO nanopowder for Automotive Applications	47.8	SERB,DST, Govt. of India	PI
4.	Product and Supply of carbon coated LiFePO <sub>4</sub> , Scale-up of the process of Nb-doped LiFePO <sub>4</sub> and characterization of Li-ion battery materials	10	NSTL, DRDO	Co-PI
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 Mg-Zn alloys for Biodegradable Implant	-	In-House	PI
9.	Technology Research Center( TRC) for alternative energy materials	980	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	22	Nanomission	Co-PI
11.	Development of aluminum powders for additive manufacturing for industrial application in the India-Italy markets	180	GITA	Co-PI
12.	Development of biodegradable alloys and AM process for soft tissue anchors	179.08	IGSTC	Co-PI

