

Dr. Malobika Karanjai

Scientist F, Centre for Nano Materials

Educational Qualifications

1. PhD from Indian Institute of Technology, Powai, Bombay (2008) & B.E in Mechanical, National Institute of Technology, Raipur (1990)

2. **Experience**

4 years of experience as project Engineer in M/s Batliboi & Co. Ltd., Bombay (1990-1993) as plant and equipment handling in the area of effluent treatment of fine Fe/oxide based particulates of Steel industry, Bhilai for Pollution Control.

25 years of experience in International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad (1994-till date) in the area of Powder Metallurgy and consolidation for different applications. Research interests include design and process development of (i) Fe/Fe alloy powder production through reduction, powder co-reduction under hydrogen and/or carbothermic route, nano powder synthesis using chemical routes, coated powders, etc; consolidation using compaction, pressure/pressure less sintering and hot pressing as well as composite design and development. Some of the examples include structural parts, frictional materials like clutch pads or buttons, bio composites for implants, soft magnetic composites for motors /rotors, Fe based food warmer and thermal batteries applications. Designed and developed pilot level prototype batch and continuous hot presses and furnaces working under inert or reducing atmospheres. Experience includes in-house projects, collaborative projects with national, international, government bodies, private companies, entrepreneurs, etc. Guided 4 M. tech Thesis and Co-Guide in 2 PhDs.

3. **Affiliations**

1. Life Member, Powder Metallurgy Association of India (PMAI), India
2. Editorial Board Member of Transactions of PMAI journal
3. Joint Secretary, PMAI
4. Life Member, Magnetics Society of India (MSI), India
5. Editor, Srujan, Inhouse Hindi Magazine

4. **Publications**

Papers Published

1. D.N. Fedorov, B.I. Bondarenko, Y.P. Pokotylo, O.M. Sviatenko, A. Sivakumar and **M. Karanjai**, Investigation of the influence of annealing parameters on iron powders produced from Indian ore concentrate”, 1999, Eco–Technologies and Energy Savings, Journal of Scientific studies, vol 5, 20-27. (Ekotechnologii IRresursosberezhenii)

2. Bondarenko B.I, Fedorov D.N, A.I. Khovavko, **M. Karanjai**, R. Sundaresan and A. Sivakumar, Study of soft magnetic iron powder production, Workshop on production and applications of soft magnetic materials for electric motors, European Powder Metallurgy Congress in Munich Trade Fair Centre, Germany, October 18-20, 2000, 103-109.
3. Fedorov D.N, **M. Karanjai**, A. Sviatenko, A. Sivakumar, Study of the obtaining process of produce low carbon reduced iron powder from hematite by method of frozen furnace, Poroshkovaya Metallurgia, vol ¾, March-April, 2002, pp 115-122.
4. Fedorov D.N, **M. Karanjai**, A. Sviatenko, A. Sivakumar, Study of the obtaining process of produce low carbon reduced iron powder from hematite by method of frozen furnace, Powder metallurgy and metal ceramics, vol. 4/4, p 212-218, 2002.
5. **M. Karanjai**, D.N. Fedorov and A. Sivakumar, Iron based alloy powder Fe-P for soft magnetic application by a thermo-chemical process, Transactions of Powder Metallurgy Association of India, vol 28, 2002, pp 22-30.
6. A.I. Khovavko, D.N. Fedorov and **K. Malobika**, Thermodynamic evaluation of reduction of silica in the presence of iron, Transactions of powder metallurgy association of India, vol 28, 2002, pp 64-70
7. A.I. Khovavko, **K. Malobika**, A.M. Sviatenko and D.N. Fedorov, Study of reduction kinetics of blue dust”, Powder Metallurgy in Automotive applications-II, Chapter 2, Eds. T.R. Rama Mohan & P. Ramakrishnan, Oxford and IBH Publications Co. Pvt. Ltd., 2002, pp 95-104.
8. DN Fedorov, B.I. Bondarenko, E.P.Pokotilo, A.M Sviatenko, A. Sivakumar & M. Karanjai, Study of the Preparation of Reduced Low-Carbon Iron Powder from Haematite Using the ‘Frozen Furnace’ Experiment, Powder Metallurgy and Metal Ceramics, Vol. 41, Nos. 3-4, 2002 pp 212-218
9. D.N. Fedorov, **M. Karanjai** and A. Sivakumar, Development of technologies to produce iron based powder from Indian Blue Dust, Euro PM 2004 (Conference proceedings) Powder manufacturing and processes, 2004, 105-110 Editors Dr. Herbert Danninger and Dr. Raimund Razi.
10. D.N. Fedorov, **M. Karanjai**, R. Sundaresan and A. Sivakumar, Selection of alloying method to produce iron based powder, Powder Metallurgy and metal ceramics, 44(5/6), pp 211-215, 2005.
11. D.N. Fedorov, **M. Karanjai**, R. Sundaresan and A. Sivakumar, Selection of alloying method to produce iron based powder, Poroshkovaya Metallurgia, vol 5/6, p. 8-13, 2005.
12. **M. Karanjai**, R. Sundaresan, G. V.N. Rao, T.R. Rama Mohan, B.P. Kashyap, Development of titanium based biocomposite by powder metallurgy processing with *in situ* forming of Ca-P phases, Mat.Sc. Engg. A, 2007, 447 (1-2), 19–26. Cited 22
13. **M. Karanjai**, B.V. Manoj Kumar, R. Sundaresan, B. Basu, T.R. Rama Mohan and B.P. Kashyap, Fretting wear study on Ti-Ca-P biocomposite in dry and simulated body fluid, Mat. Sc and Engg A, 2008, 475 (1-2), 299-307. Cited 18
14. **M. Karanjai**, R. Sundaresan, T.R. Rama Mohan and B.P. Kashyap, Evaluation of growth of calcium phosphate ceramics on Ti-Ca-P biocomposites, Mat. Sc. Engg. C, 2008, 28, 1401-1407. Cited by 8
15. **M. Karanjai**, A. Jyothirmayee, R. Sundaresan, T.R. Rama Mohan and B.P. Kashyap, Corrosion behaviour of PM processed Ti-Ca-P composites in Hank’s Balanced Salt Solution using potentiodynamic studies, International Journal of Applied Ceramic Technology, 7[2], 148-155, 2010. (cited by 11)
16. J. Nitesh Raj, R. Bollina, V. Uma & **M. Karanjai** *, Consolidation of Composite Iron Powder by Spark Plasma Sintering for Soft Magnetic Applications, Transactions of PMAI Vol. 38, pp21-24 2015
17. Arunagshu Das, Susenjit Sarkar, **Malobika Karanjai***, Experimental investigation of the compressibility and mechanical properties of Cp-Ti powder metallurgy components, Transactions of PMAI, Vol. 42 No. 1, pp 32-38, June 2016.
18. Arunagshu Das, Susenjit Sarkar, **Malobika Karanjai***, Goutam Sutradhar, Application of Box-Behnken Design and Response Surface Methodology for Surface Roughness Prediction Model of CP-Ti Powder Metallurgy Components through WEDM, J. Inst. Eng. India Ser. D, Springer publications, DOI 10.1007/s40033-017-0415-0

19. **A. Das**, S. Sarkar, **Malobika Karanjai** and G. Sutradhar presented a paper on ‘RSM based study on the influence of Sintering Temperature on MRR for Titanium powder Metallurgy Products using Box-Behnken Design’, *Materials Today: Proceedings* 5(2018) 6509-6517.
20. **A. Das**, S. Sarkar, **Malobika Karanjai** and G. Sutradhar, Investigation of the Compressibility and Machinability of Sintered Titanium Powder Metallurgy parts vis-à-vis cast Titanium Products, *Transactions of 65th Indian Foundry Congress* (2017), 162-169.
21. **A. Das**, S. Sarkar, **Malobika Karanjai** and G. Sutradhar, “An experimental investigation into the role of sintering temperature on the metal removal; rate of titanium powder metallurgy products through Taguchi method”, *Indian Journal of Engineering and Materials Sciences*, Vol 25, Oct 2018, 377-382.

Presentations

1. K. Malobika*, A. Sivakumar, D.N. Fedorov, A. Sviatenko, Optimization of chemistry of sponge iron powder, presented at POWMAT’99, Hyderabad.
2. K. Malobika*, Reduction-de carburising annealing and its application to iron systems, ARCI, 1999.
3. K. Malobika*, S.B. Chandrasekhar, A. Sivakumar, Sintering studies on iron powders produced from haematite and magnetite, presented at PMAI 2000, Chennai.
4. Bondarenko B.I, Fedorov D.N, A.I. Khovavko, M. Karanjai*, R. Sundaresan and A. Sivakumar, Comparative study of iron powders produced through different routes for soft magnetic applications, Workshop on production and applications of soft magnetic materials for electric motors, European Powder Metallurgy Congress, Munich Trade Fair Centre, Germany, October 18-20, 2000.
5. M. Karanjai*, D.N. Fedorov and A. Sivakumar, Iron based alloy powder Fe-P for soft magnetic application by a thermo-chemical process, PM 02, India Habitat Centre, New Delhi, 2002.
6. A.I. Khovavko, D.N. Fedorov and K. Malobika*, Thermodynamic evaluation of reduction of silica in the presence of iron, PM 02, India Habitat Centre, New Delhi, 2002.
7. A.I. Khovavko, K. Malobika*, A.M. Sviatenko and D.N. Fedorov, Study of reduction kinetics of blue dust”, *Powder Metallurgy in Automotive applications-II*, 2002
8. M. Karanjai*, R. Sundaresan, T.R. Rama Mohan and B.P. Kashyap, Titanium-calcium-phosphatic Biocomposites through powder metallurgy, PMAI 03, Kolkata, 22nd -23rd Jan, 2004.
9. M. Karanjai*, R. Sundaresan, T.R. Rama Mohan and B.P. Kashyap, Titanium-calcium-phosphatic Biocomposites through PM Processing-a Study, Indo-Australian Conference on Biomaterials, Implantable devices and Tissues Engineering, *BITE 05*, SCTIMST, Trivandrum, India, 19th-21st Jan. 2005.
10. Malobika Karanjai*, Ranganathan Sundaresan, Tallapragada Raja Rama Mohan, Bhagwati Prasad Kashyap, Processing and properties of *in situ* Ti-Ca-P biocomposite by PM processing for load bearing applications, International conference on Design of Biomaterials (BIND 06), 8-11th December, 2006, IIT Kanpur, India (**Invited talk**)
11. M. Karanjai, A. Jyothirmayee, R. Sundaresan, T.R. Rama Mohan and B.P. Kashyap, EIS studies of PM processed Ti-Ca-P biocomposites in Hanks balanced salt solution, PM-07, International conference with exhibition, Emerging Solutions through Powder Metallurgy for Automotive and Engineering Industry, PMAI, New Delhi, Feb 9-11, 2007, N. Delhi, India.
12. Malobika Karanjai*, Deepak K. Pattanayak, B. P. Kashyap, B. T. Rao, R. Sundaresan, T. R. Rama Mohan, Studies in synthesis of particulate bioceramic composite materials, Indo-US workshop on composite biomaterials and implants, Indian Institute of Technology, 11-13th Dec 2007, Chennai, India. (**Invited talk**)
13. M. Karanjai*, D. Chakrabarty and V. Mahender, Production of nano- crystalline titania using chemical vapour synthesis process, PM 08, International Conference and exhibition, Cost Effective Technologies for net shape production, Chennai Trade Centre, Chennai, India, 20-21st Feb 2008.

14. M. Karanjai*, Y. Krishnapriya, D. Sen, A. Shiva Kumar and A. Venugopal Reddy, Effect of pressure assisted sintering on Fe-based composite material– a comprehensive evaluation, The Fourth Asian Particle Technology Symposium (APT 2009), New Delhi, India, 14-16th Sept 2009. **(Invited talk)**
15. M. Karanjai*, A. Siva kumar, G. Babu and P.G Reddy, Sintering of cermet composites using a newly designed hot press, International conference and exhibition on PM in processing of particulate materials and products (PM10), Jaipur, India, 28-30th January 2010.
16. M. Karanjai*, Composite Friction Materials, Powder metallurgy Short Course for Practicing Powder Metallurgists in Industries (PMSC), Pune, India, 9-11th October 2011, **(Invited talk)**
17. M. Karanjai*, Y. Krishnapriya, D. Sen and A.Siva Kumar, Interdependence of sintering time-temperature-pressure on thermal behaviour of cermet friction composites, International conference & Exhibition on powder Metallurgy for Automotive and Engineering Industries- PM11, Pune, India, 2nd-4th February 2011.
18. M. Karanjai, D.Sen and A. Siva kumar, “Future trends in design of friction materials for improved life and passenger comfort-A case study of ‘Multi piston hot press (MPHP) for bonded cerametallic friction pads useful for clutch and brake applications”, Invited talk, PM12, 2-4th Feb, Bombay **(Invited talk)**.M. Karanjai*, PM composite friction materials, Powder Metallurgy Short Course, Indian Institute of Technology-PMSC12, Mumbai, India, 15-18th March, 2012 **(Invited talk)**
19. M. Karanjai* and A. Jyothirmayee, Corrosion aspects of cermet friction materials, International conference & Exhibition on powder Metallurgy for Automotive and Engineering Industries-PM13, Pune, India, 2nd-4th February, 2013 **(Plenary session talk)**
20. **M. Karanjai:** PM composites in biomedical applications, PMSC-2012 21st-24 Feb 2013 (invited talk)
21. **M. Karanjai,** Aviral B, Uma V, Neha H, Gopalan R & Chandrasekaran V, Development of PM processed Fe-based soft magnetic material for automotive applications, PM14, Chennai, 23rd Jan 2014 (Plenary session talk).
22. **Malobika Karanjai,** “Composite materials and their processing”, 18-21st November, 2013, PM short Course, ARCI Hyderabad
24. **Malobika Karanjai,** Cerametallic composites, ‘International workshop on Ceramics, Carbon and Diamond’, 22ND-26th September 2013, Nasik, (Invited Talk).
25. **Malobika Karanjai,** Friction Composite Materials, ‘International workshop on Carbon, Composites and Diamond’, 31-31st October 2014, (Invited Talk).
26. **Malobika Karanjai,** Development and consolidation of silica coated iron powder for soft magnetic applications, at International Conference on Particulate Materials and Automotives, special focus on magnetic materials applications PM14, 23th-25th Jan 2014, Chennai, (Invited Talk).
27. **Malobika Karanjai,** Friction materials and composites, PMSC14, December 03-05, 2014, Ahmedabad (Invited Talk).
28. **Malobika Karanjai,** PM in bioengineering Materials, PMSC14, December 03-05, 2014, Ahmedabad (Invited Talk).
29. **Malobika Karanjai,** Resin-inorganic coated bonded magnets’, International conference of Advancements in Polymeric Materials, IISc Bangalore, 20th -22nd Feb 2015 (Invited Talk).
30. M. Karanjai, Structure Property Correlation of Hot Pressed Oxide Coated Powders, 19th -21st Jan 2015, at International conference of PM15, Mumbai (Invited Talk).
31. M. Karanjai, PM Friction Materials in Clutches and Brakes’’, 24th-27th September 2015, Carbon, Composites and Diamond, CCD15, Pune (Invited Talk).
32. Malobika Karanjai, Friction Materials and Composites at Powder Metallurgy Short Course PMSC 2016 at Government College of Engineering, PUNE on 26th Nov. 2015 (Invited Talk).
33. M. Karanjai, Soft magnetic composites for automobile applications: Promises and challenges, 18-20th Feb 2016, Pune, International Conference on Particulate Materials and Automotives, PM16 (Invited Talk).
34. Malobika Karanjai, **A. Das,** S. Sarkar and G. Sutradahar, Experimental investigation of the compressibility and mechanical properties of Cp-Ti powder metallurgy components, 18-20th Feb 2016, Pune, ATM, International Conference on Particulate Materials and Automotives, PM16.

35. Malobika Karanjai, Advances in PM processed composites – promises and challenges, 19-20th Jan, IIT Bombay, 3rd Indo-Austrian symposium on Advances in Materials Engineering-AME2016 (Invited talk).
36. Malobika Karanjai, Hot consolidation and Hot isostatic Pressing, 20th -22nd Feb 2017, New Delhi, Special session on business opportunities at Intl. Conf. on Powder Metallurgy and Particulate Materials- GoPM, PM17 (invited talk).
37. **A. Das**, S. Sarkar, Malobika Karanjai and G. Sutradahar, Investigation of the Wire-EDM characteristics on CP-Titanium powder metallurgy components –an RSM approach, 20th -22nd Feb 2017, Delhi, Intl. Conf. on Powder Metallurgy and Particulate Materials and 43rd Annual Technical Meet, PM17.
38. Dr. Malobika Karanjai delivered an Invited lecture on “Newer challenges in high density PM Parts” at ‘International Conference on Powder Metallurgy and Particulate Materials (PM17)’ at New Delhi at during 21st-22nd Feb 2017.
39. A. Das, S. Sarkar, **Malobika Karanjai** and G. Sutradahar, ‘RSM based study on the influence of Sintering Temperature on MRR for Titanium powder Metallurgy Products using Box-Behnken Design’ at 7th International Conference of Materials Processing and Characterisation (ICMPC 2017), 17-19th March 2017, Gokkaraju Rangaraju Institute of Institute of Engineering and Technology(GRIET), Hyderabad, Telangana (Invited talk).
40. **Mr. Shaik Riyazuddin**, Dr. Malobika Karanjai, Joydip Joardar, Pramod H. Borse, “Comparison of nano-structured Nickel Phosphide film on graphite substrate versus FTO substrates”, National Conference on Advances in Materials and Manufacturing Technologies (NCAMMT’17), SRM University, Vadapalani campus, Chennai, 24-25th March 2017.
41. **A. Das**, S. Sarkar, Malobika Karanjai and G. Sutradahar, ‘An Experimental Investigation of the Machining Characteristics of CP-Ti Powder Metallurgy Components by Wire-Cut EDM’, 6th International and 27th All India Manufacturing Technology, Design and Research Conference (AIMTDR 2016), College of Engineering Pune, Maharashtra, 16th -18th December 2016.
42. **Malobika Karanjai** delivered an invited talk on, “Composites: the Future” at Matrushi Engineering College, Saidabad, Hyderabad
43. **Malobika Karanjai** delivered an invited talk on, ‘Core-shell’ powders of Fe-Mn_xZn_yFe₂O₄ powders for their application as Magnetic Composites/cores: Design & evaluation’ at ‘International Conference on Powder Metallurgy and Particulate Materials (PM18)’ at Navi Mumbai during 21st-22nd Feb 2018.
44. **Malobika Karanjai** delivered an invited talk on “*World of composites- conventional and niche applications*’ on 20th March 2018, at GMR Institute of Technology, GMR Nagar, Rajam
45. Malobika Karanjai delivered an invited talk on “Women in STEM” under a DST residential orientation program for 35 meritorious girl students of 11th std. for motivation on scientific career at IITH on 18th May 2018.
46. Malobika Karanjai delivered an invited talk, “Composites-conventional & niche applications”, on a two-day national workshop of Powder Metallurgy & Advanced Composites, RGUTK Basar on 28th September 2018
47. Malobika Karanjai delivered an invited talk, “Friction materials and Composites”, at Powder Metallurgy Short Term Course (PMSC 2018) organised by PMAI from 12th-15th October 2018 at COEP, Pune.
48. Malobika Karanjai delivered an invited talk, ‘Fe powder production from direct reduction of ores’ at a 2-day International Conference organized by IIM Bhilai Chapter& SAIL, Bhilai Steel Plant, Bhilai on 26th October 2018.
49. Malobika Karanjai delivered an invited talk, “Composites: Spread in Present and Future Engineering Applications” in a 2-day National Seminar on “Recent Trends in Materials Research for Science

- and Engineering Applications (RTMRSEA-2018) organized by M.V.S.R Engineering College, Nadargul, Hyderabad 20th December 2018.
50. Malobika Karanjai delivered an invited talk, “Composites: Spread in Present and Future Engineering Applications” in an Orientation program for Lecturers, organized by Physics department, Osmania University, Hyderabad 5th January 2019.
 51. Malobika Karanjai **delivered a keynote lecture**, “Design of a Novel Progressive Reactive Hot Press (PRHP) for PM alloys and composites” in a 3-day Asian Powder Metallurgy Conference APMA2019, held at Pune India, dtd. 21st Feb 2019.
 52. Malobika Karanjai **delivered a motivational talk**, Commercially Viable Technologies from ARCI, GOI” at an ‘Awareness program on food processing, life sciences and MSMEs’ at Vijayawada on 26th March 2019, organized by **ALEAP**
 53. Malobika Karanjai **delivered a lecture**, PM composites and application” as part of course work for under graduate students at Materials Science and Engineering, IIT Hyderabad on 24th April 019.

Patents:

1. B.I. Bondarenko, Y. Pokatilov, A. Sviatenko, D. Fedorov, Malobika. K and A. Sivakumar, A method and apparatus for applying a protective carbon black coating on metallic surfaces, filed in 1999, patent application no. 719/MAS/1999, granted on 13/11/2007, patent no. 211922.
2. J. Pandurangam, Malobika. K, Process for carbothermic reduction of iron oxide in an immiscible flow with constant descent in vertical retort of silicon carbide, application No: 546/CHE/2003A, date of filing: 01/07/2003, Publication Date: 29/06/2007, patent no. 205728.
3. Malobika. K, R. Sundaresan, T.R. Rama Mohan, B.P. Kashyap, Titanium based biocomposite material useful for orthopaedic and other implants and a process for its preparation, patent application no. 2490/DEL/2005, patent no. 228353, granted on 03/02/2009.
4. Malobika. K and A. Siva Kumar, ‘A PROCESS AND A MULTI PISTON HOT PRESS FOR PRODUCING POWDER METALLURGY COMPONENTS, SUCH AS CERAMETALLIC FRICTION COMPOSITES’, application no. 3844/DEL/2011, dtd. 28.12.2011, published 05/07/2013.
5. Malobika Karanjai, A. Siva Kumar and G. Babu, ‘A novel equipment to accomplish powder metalurgy processing starting from ‘raw materials to final product, application no. 201711011552 dated 30th March 2017
6. Malobika Karanjai, Pramod H Borse and A. Siva Kumar, Process of electroless nickel/nickel phosphide (en) deposition on graphite substrates, application no.201811041418 dt.1st Nov 2018