

## Scientist/Officers biodata

a. **Name:**

Dibyendu Chakravarty

b. **Qualification:**

M.Tech (IT-BHU); PhD in Materials Science (IISc Bangalore)

c. **Designation:**

Scientist-E

d. **Contact information**

Center for Nanomaterials

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e. **Experience:**

18 years

f. **Research Areas of Interest:**

- Synthesis and consolidation of nanomaterials
- Processing of ceramics and metals
- Spark plasma sintering of ceramic, metallic and composite materials
- Energy materials
- Biomaterials
- Cutting tools
- High Entropy Alloys
- Transparent and porous materials
- Graphene

g. **List of Journal Publications:**

1. Dibyendu Chakravarty, S. Roy, P.K. Das, "DC resistivity of alumina and zirconia sintered with TiC," Bulletin of Materials Science. 28[3], 227-231, 2005.
2. N.V Rama Rao, R.Gopalan, M. Manivel Raja, V.Chandrasekharan, D.Chakravarty, R.Sundaresan, R.Ranganathan, K.Hono, "Structural and magnetic studies on spark plasma sintered SmCo<sub>5</sub>/Fe bulk nanocomposite magnets," Journal of Magnetism and Magnetic Materials. 312, 252-257, 2007.
3. Dibyendu Chakravarty, Prakash Singh, Sindhu Singh, Devendra Kumar, Om Parkash, "Electrical conduction behavior of high dielectric constant perovskite oxide La<sub>x</sub>Ca<sub>1-3x/2</sub>Cu<sub>3</sub>Ti<sub>4</sub>O<sub>12</sub>," Journal of Alloys and Compounds. 438, 253-257, 2007.
4. D.Roy, D.Chakravarty, R.Mitra, I.Manna, "Effect of sintering on microstructure and mechanical properties of nano-TiO<sub>2</sub> dispersed Al<sub>65</sub>Cu<sub>20</sub>Ti<sub>15</sub> amorphous/nanocrystalline matrix composite," Journal of Alloys and Compounds. 460,320-325, 2008.

5. Dibyendu Chakravarty, S. Bysakh, K.Muraleedharan, Tata N Rao, R. Sundaresan, "Spark Plasma Sintering of Magnesia-Doped Alumina with High Hardness and Fracture Toughness," *Journal of the American Ceramic Society*. 91[1], 203-208, 2008
6. Dibyendu Chakravarty, H.Ramesh, Tata N.Rao, "High strength porous alumina by spark plasma sintering," *Journal of the European Ceramic Society*. 29, 1361-1369, 2009.
7. R.Mazumder, D.Chakravarty, D.Bhattacharya, A.Sen, "Spark plasma sintering of BiFeO<sub>3</sub>," *Materials Research Bulletin*. 44, 555-559, 2009.
8. Dibyendu Chakravarty, G. Sundararajan, "Effect of Applied Stress on IR transmission of Spark Plasma-Sintered Alumina," *Journal of the American Ceramic Society*. 93[4],951-953, 2010.
9. A.Mukhopadhyay, Dibyendu Chakravarty, B.Basu, "Spark Plasma Sintered WC-ZrO<sub>2</sub>-Co Multi Phase Nanocomposites with High Fracture Toughness and Strength," *Journal of the American Ceramic Society*. 93[6], 1754-1763, 2010
10. K.Rajeswari, U.S.Hareesh, Dibyendu Chakravarty, R.Subasri, Roy Johnson, "Comparative evaluation of SPS, MW and TTS on the density and microstructure evaluation of stabilized ZrO<sub>2</sub> ceramics," *Science of Sintering*. 42, 259-67, 2010
11. Amit S Sharma, K.Biswas, B.Basu, Dibyendu Chakravarty, "Spark Plasma Sintering of nanocrystalline Cu and Cu-10 wt % Pb," *Metallurgical and Materials Transactions A*. 42[7], 2072-84, 2011
12. Dibyendu Chakravarty, B. V. Sarada, S.B. Chandrasekhar, K.Saravanan, T.N.Rao, "A novel method of fabricating porous silicon," *Materials Science and Engineering A*. 528 (25-26), 7831-34, 2011.
13. Dibyendu Chakravarty, Hina Gokhale, G. Sundararajan, "Optimizing mechanical properties of spark plasma sintered ZTA using neural network and genetic algorithm," *Materials Science and Engineering A*. 529, 492-96, 2011.
14. B.Suresh, K.Rajeswari, Dibyendu Chakravarty, D.Das, R.Johnson, "Effect of nano grain size on the ionic conductivity of spark plasma sintered 8YSZ electrolyte," *International Journal of Hydrogen Energy*. 37 (1), 511-517, 2012
15. S.Shalini, P.Sandhyarani, Y.S.Rao, D.Chakravarty, R. Subasri, "Wet chemical synthesis and characterization of Na<sup>+</sup> conducting sodium dysprosium silicates," *Ceramics International*. 38 (1), 295-300, 2012.
16. M.J.Anjali, P.Biswas, D. Chakravarty, U.S.Hareesh, Y.S.Rao, R.Johnson, "Low temperature in-situ reaction sintering of zircon-alumina composites through SPS," *Science of Sintering*. 44, 323-330, 2012

17. Dibyendu Chakravarty, G. Sundararajan, "Microstructure, mechanical properties and machining performance of spark plasma sintered  $\text{Al}_2\text{O}_3\text{-ZrO}_2\text{-TiCN}$  nanocomposites," *Journal of the European Ceramic Society*. 33, 2597-2607, 2013.
18. R.Papitha, M. Buchi Suresh, D. Chakravarty, A Swarnakar, D.Das, R. Johnson, "Eutectoid decomposition of aluminum titanate ( $\text{Al}_2\text{TiO}_5$ ) ceramics under spark plasma sintering (SPS) and conventional (CRH) thermal treatments," *Ceramics International*. 40, 659-66, 2014.
19. Dibyendu Chakravarty, Atul Chokshi, "Direct Characterizing of Densification Mechanisms during Spark Plasma Sintering," *Journal of the American Ceramic Society*, 97[3], 765-71, 2014.
20. S. Varam, PVSL Narayana, MD Prasad, D. Chakravarty, K.V. Rajulapati, Bhanu Sankara Rao, "Strain rate sensitivity of bulk multiphase nanocrystalline Al-W-based alloy," *Phil. Mag. Letter*, 94[9], 582-91, 2014.
21. P.Saravanan, V.T.P Vinod, M.Cernek, D. Chakravarty, P.Ghoshal, S.V.Kamat, "Exchange coupled rare earth free Mn-Al/Fe nanocomposite magnets by SPS," *Materials Letters*, 137, 369-72, 2014.
22. P.Saravanan, V.T.P Vinod, M.Cernek, A. Selvapriya, D. Chakravarty, S.V.Kamat, "Processing of Mn-Al nanostructured magnets by SPS and subsequent rapid thermal annealing," *Journal of Magnetism and Magnetic Materials*, 374, 427-32, 2015.
23. Dibyendu Chakravarty, Atul Chokshi, "Influence of Yttria and Zirconia Additions on Spark Plasma Sintering of Alumina Composites," *Journal of Materials Research*, 30[8], 1148-56, 2015.
24. Dibyendu Chakravarty, C.S.Tiwary, L.D.Machado, G.Brunetto, S.Vinod, R.M.Yadav, D.S.Galvao, S.V.Joshi, G.Sundararajan, P.M.Ajayan, "Zirconia nanoparticle reinforced, morphology engineered graphene based foam," *Advanced Materials*, 27, 4534-43, 2015.
25. Mohan Nuthalapati, S.K.Karak, Dibyendu Chakravarty, A. Basu, "Development of nano- $\text{Y}_2\text{O}_3$  dispersed Zr alloys by mechanical alloying and spark plasma sintering," *Mater Sc and Engg. A*, 650, 145-153, 2016
26. P. Barick, Dibyendu Chakravarty, B.P. Saha, R. Mitra, S.V.Joshi, "Effect of pressure and temperature on densification, microstructure and mechanical properties of spark plasma sintered silicon carbide processed with  $\beta$ -silicon carbide nanopowder and sintering additives," *Ceramics International*, 42[3], 3836-48, 2016
27. P.Sahani, S.K.Karak, B.Mishra, Dibyendu Chakravarty, D. Chaira, "Effect of Al addition on SiC-B4C cermet prepared by pressureless sintering and spark plasma sintering methods," *Inter Journal of Refract Met and Hard Mater*, 57, 31-41, 2016

28. Rishu Kumar, Kushal Singh, Dibyendu Chakravarty, Anirban Chowdhury, "Attaining neat-theoretical densification in nanograined pyrochlore  $\text{La}_2\text{Zr}_2\text{O}_7$  (LZ) ceramic at  $1150^\circ\text{C}$  by spark plasma sintering," *Scripta Materialia*, 117, 37-40, 2016
29. P.Sahani, S.K.Karak, B.Mishra, Dibyendu Chakravarty, D. Chaira, "A comparative study on  $\text{SiC-B}_4\text{C-Si}$  cermet prepared by pressureless sintering and spark plasma sintering methods," *Metallurgical and Materials Transactions A*, 47[6], 3065-76, 2016
30. Dibyendu Chakravarty, C.S.Tiwary, C.Woellner, S.Radhakrishnan, S. Vinod, P.A.S. Autreto, S.Bhowmick, S. Asif, S.A Mani, D. S. Galvao, P.M.Ajayan, "3D Porous Graphene by Low-Temperature Plasma Welding for Bone Implants," *Advanced Materials*, 28[40], 8959-67, 2016
31. P.Biswas, Dibyendu Chakravarty, M.B.Suresh, R.Johnson, M.Krishna Mohan, "Fabrication of graphite contamination free polycrystalline transparent  $\text{MgAl}_2\text{O}_4$  spinel by SPS using platinum foil," *Ceram. Int.* 42[15], 17920-23, 2016.
32. Mohan Nuthalapati, S.K.Karak, J. Dutta Majumdar, Dibyendu Chakravarty, A. Basu, "Corrosion behavior and high temperature oxidation kinetics of nano- $\text{TiO}_2/\text{Y}_2\text{O}_3$  dispersed zirconium alloy," *J. Alloys Comp.* 689, 908-17, 2016
33. Mohan Nuthalapati, S. K. Karak, D. Chakravarty, A. Basu, "Comparative Study on Microscopic, Physical and Mechanical Properties of Conventional and Spark Plasma Sintered Nano- $\text{TiO}_2$ -Dispersed Zirconium-Based Alloys," *Metallogr. Microstruct. Anal.*, 6, 527-540, 2017
34. P. Sai Karthik, S.B. Chandrasekhar, D. Chakravarty, P.V.V. Srinivas, V.S.K. Chakravadhanula, T.N. Rao, "Propellant grade ultrafine aluminum powder by RF induction plasma," *Adv. Powder Technol.*, 29, 804-812, 2018
35. C. Gautam, Dibyendu Chakravarty, A. Gautam, C.S.Tiwary, C.F.Woellner, V.K.Mishra, N. Ahmad, S. Ozden, S. Jose, S. Birader, R.Vajtai, R. Trivedi, D.S Galvao, P.M Ajayan, "Synthesis and 3D interconnected nanostructures h-BN-Based biocomposites by low-temperature plasma sintering: bone regeneration applications," *ACS Omega*, 3, 6013-6021, 2018
36. A.K.Mallik, M. Das, S. Das, D. Chakravarty, "Spark plasma sintering of Ti-diamond composites," *Ceram. Int.*, 45, 11281-86, 2019
37. H. Jain, Y. Shadangi, V. Shivam, D. Chakravarty, N.K.Mukhopadhyay, D. Kumar, "Phase evolution and mechanical properties of non-equiatomic Fe-Mn-Ni-Cr-Al-Si-C high entropy steel," *J. Alloys Comp.* 834, 155013-23, 2020
38. Rahul B Mane, R. Vijay, Bharat B. Panigrahi, D. Chakravarty, "High temperature decomposition kinetics of  $\text{Ti}_3\text{GeC}_2$  MAX phase," *Mater. Lett.* 282, 128853, 2021

39. D. Spandana, H. Desai, D. Chakravarty, R. Vijay, K. Hembram, "Fabrication of a biodegradable Fe-Mn-Si alloy by field assisted sintering," Adv. Powder Technol. 31[12], 4577-84, 2020

40. D. Chakravarty, N. Laxman, R. Jayasree, R.B. Mane, S. Mathiazhagan, P.V.V Srinivas, R. Das, M. Nagini, M. Eizadjou, L. Venkatesh, N. Ravi, D.R. Mahapatra, R. Vijay, S.P. Ringer, C.S. Tiwary, "Ultrahigh transverse rupture strength in tungsten-based nanocomposites with minimal lattice misfit and dual microstructure," Int. J. Ref. Met. Hard Mater. 95, 105454, 2021

41. R. Jayasree, R.B. Mane, R. Vijay, D. Chakravarty, "Effect of process control agents on mechanically alloyed  $Al_{0.3}CoCrFeNi$ ," Mater. Lett. 292, 129618, 2021

42. R.B. Mane, R.K.Sahoo, B.S.K Reddy, R. Vijay, P.H.Borse, B.B.Panigrahi, D. Chakravarty, "Doping-induced coloration in titania," J. Am. Ceram. Soc. 104, 2932-36, 2021

**h. List of Patents:**

1. Novel ceramic materials having improved mechanical properties, a process for its preparation and a process for making cutting tools of such materials, IN200503396-11
2. An improved method of preparing porous silicon compacts, patent number 304349, granted on 12-12-2018
3. Method of fabricating tungsten based composite sheets by spark plasma sintering techniques for making components, application no 201911014933 date 13-4-2019

**i. Affiliation to Professional societies:**

- Member of the American Ceramic Society
- Life member of Indian Institute of Metals (IIM)
- Life member of Materials Research Society of India (MRSI)
- Life member of Powder Metallurgy Association of India (PMAI)

**j. Awards & Honors:**

- Master of Technology Gold medal, Banaras Hindu University, 2003
- Selected for the Indo-US Science and Technology Research Fellow for the year 2014.

**k. Invited lectures:**

1. PMSC-12 at MGIT on December 22, 2012 entitled "SPS of ceramic and metallic systems for structural and functional applications"
2. CEP-50 at DMRL, Hyderabad on July 9, 2013 entitled "SPS: An emerging technique for developing structural and functional components"

3. “SPS of advanced ceramic materials” during ‘Workshop on Advanced Ceramic Processing and Fabrication’ on 12<sup>th</sup> December 2016 at ARCI, Hyderabad
4. “Nanostructured Materials for Structural and Functional Applications by SPS” during ICAMMP at IIT-Kharagpur on 5<sup>th</sup> November, 2016
5. “Recent Advancements in Cross Engineering” at Vardhaman Engineering College, Hyderabad on 14<sup>th</sup> June 2018
6. CEP on “Processing of advanced powder metallurgy alloys,” at DMRL on 28<sup>th</sup> August, 2019
7. “Spark Plasma Sintering: A Novel Versatile Ultrafast Consolidation Tool for Emerging and Niche Applications” during the International Symposium on Tribology for Sustainability at NIT-Srinagar during 17-20<sup>th</sup> June 2019
8. “SPS - A Novel PM Processing Tool for New Applications, ” at NIT-Surathkal on December 24<sup>th</sup>, 2019

1. **Photograph**

