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# Shibayan Roy

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**IIT-Kharagpur, India**

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## **Present Status**

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Assistant Professor in the Materials Science Center at Indian Institute of Technology, IIT-Kharagpur, India since November 2015.

Associated faculty in School of Nanoscience and Technology and DHI Centre of Excellence on Advanced Manufacturing Technology

## **Education**

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- PhD in Materials Engineering, Department of Materials Engineering, Indian Institute of Science – IISc Bangalore (August 2006 - November 2011)
- M. Tech. in Materials Engineering from Department of Materials and Metallurgical Engineering, Indian Institute of Technology- IIT Kanpur (August 2003 - May 2005).
- B. Tech. in Ceramic Technology, College of Ceramic Technology, Calcutta University (August 1999 – July 2003).

## **Previous Employment**

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- Guest Scientist at Institute for Materials, Faculty of Mechanical Engineering, Ruhr University Bochum, Germany (May 2018 - July 2018)
- Visiting faculty at University of Tennessee Bredesen Center, Knoxville, USA (June 2016 to July 2016)
- Post-doctoral Research Associate in Mechanical Characterization and Mechanics Group at Materials Science and Technology Division, Oak Ridge National Laboratory (ORNL), Oak Ridge, USA (November 2013 to October 2015).
- Post-doctoral Researcher at Institute for Materials Science and Engineering (IWW), Department of Mechanical Engineering, Chemnitz University of Technology, Germany (February 2012 – October 2013).
- Post-doctoral Research Associate in Department of Materials Engineering, Indian Institute of Science – IISc Bangalore (August 2011 - January 2012)

- Scientist B Gr. IV(1) in Surface Engineering Division (SED), National Aerospace Laboratories (NAL), Council of Scientific and Industrial Research-CSIR (June 2005 - July 2006).

## **Honors/Awards**

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- **Fulbright-Nehru Academic and Professional Excellence Fellowships 2022-2023** from United States-India Educational Foundation (USIEF).
- **‘TMS – EPD Materials Characterization Best Poster Award (Third Place)’** in TMS Annual Meeting, March 2018
- **‘R&D 100 award (2017)’** (as a part of the research group from ORNL, USA)
- **Best poster award** in the Annual Meeting & Exhibition of TMS in 2017 held in Nashville, USA
- **‘Student Innovative Thesis Award (Doctoral level)’** from *Indian National Academy of Engineering (INAE)* in 2012.
- **‘K.P. Abraham Gold Medal for Best Doctoral Thesis’** from Indian Institute of Science, Bangalore in 2012.
- **Best presentation award (Oral)** in the Annual Technical Meeting (NMD-ATM) of Indian Institute of Metals (IIM) in 2010 held in IISc, Bangalore.
- **Best presentation award (Oral)** in the Annual Technical Meeting (NMD-ATM) of Indian Institute of Metals (IIM) in 2009 held in Kolkata.
- **National Doctoral Fellowship** from All India Council for Technical Education (AICTE) for carrying out the doctoral research at IISc (2007-2010).
- M. Tech thesis shortlisted for **‘Student Innovative Thesis Award (Masters level)’** from *Indian National Academy of Engineering (INAE)* in 2006.
- **Best presentation award** in International Symposium for Research Scholars (ISRS) organized by IIT Madras in 2004.
- Qualified GATE 2003 with AIR XE-47
- **National scholarship** for Secondary (Ranked 20<sup>th</sup> in WBBSE) and Higher Secondary examinations.

## **Research Expertise**

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- Processing-microstructure-property correlation in materials
- Glass and glass-ceramics
- Light metals and alloys
- Crystallographic texture evolution and Electron back-scatter diffraction
- Meso- and micro-scale mechanical characterization
- Additive and Laser based manufacturing
- Modelling of mechanical response

## Professional services

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- **Project reviewer for**

- Science and Engineering Research Board, Department of Science & Technology (DST-SERB), India
- Scheme for Promotion of Academic and Research Collaboration (SPARC), Ministry of Human Resource and Development, Government of India
- Excellence initiative of the German Federal and State Government, RWTH Aachen, Germany

- **Journal reviewer for**

- Scientific Reports (A Nature series open-access publication)
- Journal of Materials Research
- Materials Science and Engineering A
- Metallurgical and Materials Transaction A
- Materials Characterization
- Journal of Alloys and Compounds
- Materials and Design
- Intermetallics
- Journal of Materials Science
- Transaction of Indian Institute of Metals
- Indian Journal of Engineering & Materials Sciences
- Bulletin of Materials Science
- Chinese Journal of Aeronautics

- **Past and present membership of professional societies**

- The Minerals, Metals & Materials Society (TMS)
- ASM International
- Deutsche Gesellschaft für Materialkunde (DGM)
- Materials Advantage Chapter of IISc, Bangalore
- Indian Institute of Metals (IIM)
- Indian Ceramic Society

## Journal Publications (in chronological order)

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1. B. Aashranth, A. Mahato, M. Arvinth Davinci, D. Samantaray, **Shibayan Roy**, V. Karthik, Dynamic failure in additively manufactured polylactic acid: influence of directionality and build configuration, **Journal of Metals, Under Review, 2023.**
2. G.K. Jana, S. Bera, R. Maity, T. Maity, A. Mahato, **Shibayan Roy**, H. Mohapatra, B.C. Samanta, Evaluation of mechanical and thermal properties of a natural mat fiber reinforced modified epoxy, **Pigment & Resin Technology: The international**

*journal of colorants, polymers and colour applications, Under Review, 2023.*

3. S. Basu, A.C. Arohi, A. Mahato, D. Chakravarty, I. Sen, **Shibayan Roy**, 'Understanding the correlation between composition, microstructure and mechanical properties for spark plasma sintered (SPS) Alumina-Zirconia composites', *Journal of Materials Engineering and Performance, Under Review, 2023.*
4. P. Nath, F. Scholz, J. Pfetzinger, J. Frenzel, G. Eggeler, **Shibayan Roy**, I. Sen, 'Effective microstructural homogenization and its influence on the localized mechanical properties of single crystal Ni-based superalloy CMSX-4', *Advanced Engineering Materials, Provisionally Accepted, 2023.*
5. M. Garai, **Shibayan Roy**, 'Performance evaluation for Ag & Au nanoparticle containing K<sub>2</sub>O-MgO-B<sub>2</sub>O<sub>3</sub>-Al<sub>2</sub>O<sub>3</sub>-SiO<sub>2</sub>-F glass sealants for SOFC application', *International Journal of Ceramic Engineering and Science, Published Online, 2023.*
6. **Shibayan Roy**, A. Sharma, A Chaudhuri, Y. Huang, T. G. Langdon, S. Suwas, 'Microstructure evolution and mechanical response of a boron-modified Ti-6Al-4V alloy during high-pressure torsion processing', *Materials Science and Engineering A, 860 (2022) 144124.*
7. S. Sahoo, O. Licata, B. Mazumder, **Shibayan Roy**, 'Novel insights on the atomic scale spatial distributions of substitutional alloying and interstitial impurity elements in Ti-6Al-4V alloy', *Journal of Alloys and Compound, 907 (2022) 164511.*
8. S Sahoo, A. Joshi, V. K. Balla, M. Das, **Shibayan Roy**, 'Site-dependent microstructure, porosity and mechanical properties of LENS<sup>TM</sup> processed Ti-6Al-4V alloy', *Materials Science and Engineering A, 820 (2021) 141494.*
9. E. Hoar, S. Sahoo, M. Mahdavi, S. Liang, **Shibayan Roy**, H. Garmestani, 'Statistical modeling of microstructure evolution in a Ti-6Al-4V alloy during isothermal compression', *Acta Materialia, 210 (2021) 116827.*
10. M. Garai, B Karmakar, **Shibayan Roy**, 'Cr<sup>+6</sup> controlled nucleation in SiO<sub>2</sub>-MgO-Al<sub>2</sub>O<sub>3</sub>-K<sub>2</sub>O-B<sub>2</sub>O<sub>3</sub>-F glass sealant (SOFC)', *Frontiers in Materials, 7 (2020) 1-15.*
11. B. K. Milligan, **Shibayan Roy**, C. S. Hawkins, L.F. Allard, A. Shyam, 'Impact of microstructural stability on the creep behavior of cast Al-Cu alloys', *Materials Science and Engineering A, 772 (2020) 138697.*
12. A. Shyam, **Shibayan Roy**, D. Shin, L.F. Allard, Y. Yamamoto, J. R. Morris, B. Mazumder, J. D. Poplawsky, J. C. Idrobo, A. Rodriguez, T. R. Watkins, J. A. Haynes, 'Extreme microstructural stability at elevated temperature in cast aluminum-copper alloys', *Materials Science and Engineering A, 765 (2019) 138279.*
13. M. Garai, A. K. Maurya, **Shibayan Roy**, 'Zn<sup>2+</sup>-controlled crystallization and microstructure in K-Li-Mg-B-Si-Al-F glass', *MRS Advances (2018) 1-9.*
14. **Shibayan Roy**, S. Suwas, 'Unique texture transition during sub  $\beta$ -transus annealing of warm-rolled Ti-6Al-4V alloy: Role of orientation dependent spheroidization', *Scripta Materialia, 154 (2018) 1-7.*

15. I. Sen, **Shibayan Roy**, M. F.-X. Wagner, 'Indentation response and structure-property correlations in a bimodal Ti-6Al-4V alloy', ***Advanced Engineering Materials***, **19** (2017) 1-12.
16. D. Shin, **Shibayan Roy**, T. R. Watkins, A. Shyam, 'Lattice mismatch modeling of Aluminum alloys', ***Computational Material Science***, **138** (2017) 149-159.
17. P. Shower, **Shibayan Roy**, C. S. Hawkins, A. Shyam, 'The effects of microstructural stability on the compressive response of two cast Aluminum alloys up to 300°C', ***Material Science and Engineering A***, **700** (2017) 519-529.
18. **Shibayan Roy**, Satyam Suwas, 'Orientation dependent spheroidization response and macro-zone formation during sub  $\beta$ -transus processing of Ti-6Al-4V alloy', ***Acta Materialia***, **134** (2017) 283-301.
19. **Shibayan Roy**, L. F. Allard, A. Rodriguez, T. R. Watkins, A. Shyam, 'Comparative evaluation of cast Aluminum alloys for automotive cylinder heads: Part I – Microstructure evolution', ***Metallurgical and Materials Transaction A***, **48** (2017) 2529-2542.
20. **Shibayan Roy**, L. F. Allard, A. Rodriguez, W.D. Porter, A. Shyam, 'Comparative evaluation of cast Aluminum alloys for automotive cylinder heads: Part II – Mechanical and thermal properties', ***Metallurgical and Materials Transaction A***, **48** (2017) 2543-2562.
21. Aashranth B, **Shibayan Roy**, S. Suwas, 'Effect of hypoeutectic boron modification on the dynamic properties of Ti-6Al-4V alloy', ***Journal of Materials Research***, **31** (2016) 2804-2816.
22. **Shibayan Roy**, G. Kannan, S. Suwas, M. K. Surappa, 'Effect of extrusion ratio on the microstructure and mechanical properties of (Mg/AZ91)<sub>m</sub>-SiC<sub>p</sub> composite', ***Material Science and Engineering A***, **624** (2015) 279-290.
23. S.T. Aruna, **Shibayan Roy**, A. Sharma. G. Savitha, V.K. William-Grips, 'Cost-effective wear and oxidation resistant electrodeposited Ni-pumice coating', ***Surface and Coatings Technology***, **251** (2014) 201-209.
24. **Shibayan Roy**, S. Suwas, 'Enhanced ductility of Ti-6Al-4V-0.1B alloy under superplastic deformation conditions by means of dynamic globularization', ***Materials & Design***, **58** (2014) 52-64.
25. **Shibayan Roy**, S. Suwas, 'On the absence of shear cracking and grain boundary cavitation in secondary tensile regions of Ti-6Al-4V-0.1B alloy during hot ( $\alpha+\beta$ )-compression', ***Philosophical Magazine***, **94**(5) (2014) 446-463.
26. **Shibayan Roy**, S. Suwas, 'Crystallographic texture and microstructure evolution during hot compression of Ti-6Al-4V-0.1B alloy in the ( $\alpha+\beta$ ) regime', ***Philosophical Magazine***, **94**(4) (2014) 358-380.
27. **Shibayan Roy**, S. Suwas, 'Microstructure and texture evolution during sub-transus thermo-mechanical processing of Ti-6Al-4V-0.1B alloy: Part I. Hot rolling in ( $\alpha+\beta$ ) phase field', ***Metallurgical & Materials Transaction A***, **44** (2013) 3303-3321.
28. **Shibayan Roy**, S. Karanth, S. Suwas, 'Microstructure and texture evolution during sub-transus thermo-mechanical processing of Ti-6Al-4V-0.1B alloy: Part II. Static annealing in ( $\alpha+\beta$ ) regime', ***Metallurgical & Materials Transaction A***, **44** (2013)

3322-3336.

29. **Shibayan Roy**, S. Suwas, 'Deformation mechanisms during superplastic testing of Ti-6Al-4V-0.1B alloy', *Materials Science and Engineering A*, **574** (2013) 205-217.
30. **Shibayan Roy**, S. Suwas, 'The influence of temperature and strain rate on the deformation response and microstructural evolution during ( $\alpha$ + $\beta$ ) hot compression of Ti-6Al-4V-0.1B alloy', *Journal of Alloys and Compounds*, **548** (2013) 110-125.
31. P. Venkatachalam, **Shibayan Roy**, B. Ravisankar, V. Thamos Paul, M. Vijayalakshmi, S. Suwas, 'Effect of processing routes on the evolution of texture heterogeneity in 2014 Aluminium alloy deformed by equal channel angular pressing (ECAP)', *Materials Science & Technology*, **28** (2012) 1445-1458.
32. **Shibayan Roy**, Nataraj B. R., S. Suwas, S. Kumar, K. Chattopadhyay, 'Microstructure and texture evolution during accumulative roll bonding of aluminium alloys AA2219/AA5086 laminates', *Journal of Materials Science*, **47** (2012) 6402-6419.
33. **Shibayan Roy**, S. Suwas, S. Tamirisakandala, R. Srinivasan, D.B. Miracle, 'Microstructure and texture evolution during  $\beta$  extrusion of hypoeutectic boron modified Ti-6Al-4V alloy', *Materials Science & Engineering A*, **540** (2012) 152-163.
34. P. Venkatachalam, **Shibayan Roy**, V. Thomas Paul, M. Vijayalakshmi, B. Ravisankar, S. Suwas, 'The role of processing routes on the evolution of microstructure and texture heterogeneity during ECAP of Al-Cu alloy', *Materials Science Forum*, **702-703** (2012) 113-118.
35. **Shibayan Roy**, Nataraj B. R., S. Suwas, S. Kumar, K. Chattopadhyay, 'Accumulative roll bonding of aluminium alloys 2219/5086 laminates: Microstructural evolution and tensile properties', *Materials & Design*, **36** (2012) 529-539.
36. **Shibayan Roy**, S. Singh D., S. Suwas, S. Kumar, K. Chattopadhyay, 'Microstructure and texture evolution during accumulative roll bonding of aluminium alloy AA5086', *Materials Science & Engineering A*, **528** (2011) 8469-8478.
37. **Shibayan Roy**, V. Tunpla, S. Suwas, 'Effect of Hypoeutectic Boron Addition on the  $\beta$ -transus of Ti-6Al-4V Alloy', *Metallurgical & Materials Transaction A*, **42** (2011) 2535-2541.
38. **Shibayan Roy**, S. Suwas, S. Tamirisakandala, D.B. Miracle, R. Srinivasan, 'Development of solidification microstructure in boron modified alloy Ti-6Al-4V', *Acta Materialia*, **59** (2011) 5494-5510.
39. P. Venkatachalam, **Shibayan Roy**, B. Ravisankar, V. Thomas Paul, M. Vijayalakshmi, S. Suwas, 'Texture evolution in an Al-Cu alloy during equal channel angular pressing: the effect of starting microstructure', *Journal of Materials Science*, **46** (2011) 6518-6527.
40. A. Sarkar, **Shibayan Roy**, S. Suwas, 'X-ray diffraction line profile analysis of deformation microstructure in boron modified Ti-6Al-4V alloy', *Materials*

**Characterization, 62 (2011) 35-42.**

41. **Shibayan Roy**, A. Sarkar, S. Suwas, 'On characterization of deformation microstructure in Boron modified Ti-6Al-4V alloy', **Materials Science & Engineering A**, **528 (2010) 449-458**.
42. S.R. Dey, **Shibayan Roy**, S. Suwas, J.J. Fundenberger, R.K. Ray, 'Annealing response of the intermetallic alloy Ti-22Al-25Nb', **Intermetallics**, **18 (2010) 1122-1131**.
43. **Shibayan Roy**, B. Basu, 'Hardness properties and microscopic investigation of crack-crystal interaction in SiO<sub>2</sub>-MgO-Al<sub>2</sub>O<sub>3</sub>-K<sub>2</sub>O-B<sub>2</sub>O<sub>3</sub>-F glass ceramic system', **Journal of Materials Science: Materials in Medicine**, **21 (2010) 109-122**.
44. **Shibayan Roy**, B. Basu, 'On the development of two characteristically different crystal morphology in SiO<sub>2</sub>-MgO-Al<sub>2</sub>O<sub>3</sub>-K<sub>2</sub>O-B<sub>2</sub>O<sub>3</sub>-F glass-ceramic system', **Journal of Materials Science: Materials in Medicine**, **20 (2009) 51-66**.
45. **Shibayan Roy**, N. Gurao, S. Suwas, S. Tamirisakandala, R. Srinivasan, D.B. Miracle, 'Texture evolution in boron modified Ti-6Al-4V alloy', **Ceramic Transaction 200 (2008) 585-592**.
46. **Shibayan Roy**, B. Basu, 'Mechanical and tribological characterization of human tooth', **Materials Characterization**, **59 (2008) 747-756**.
47. **Shibayan Roy**, B. Basu, 'In vitro dissolution behavior of SiO<sub>2</sub>-MgO-Al<sub>2</sub>O<sub>3</sub>-K<sub>2</sub>O-B<sub>2</sub>O<sub>3</sub>-F glass-ceramic system', **Journal of Materials Science: Materials in Medicine**, **19 (2008) 3123-3133**.
48. **Shibayan Roy**, B. Basu, 'Microstructure development in machinable mica based dental glass-ceramics', **Trends in Biomaterials & Artificial Organs**, **20 (2006) 90-100**.
49. S. Maitra, **Shibayan Roy**, A.K. Bandhyapadhyay, 'Synthesis of mullite from calcined alumina, silica and Al powder', **Industrial Ceramics 24 (2004) 39-41**.

**Conference Publications**

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1. A. Shyam, S. Hawkins, **Shibayan Roy**, S. Dryepondt, D. Erdman, B. Pint, P. Maziasz, "The effect of steam on the elevated temperature high cycle fatigue life of HAYNES 282® superalloy", (*invited*) **paper IMECE2014-37982, Proceedings of the ASME 2014 Int. Mech. Eng. Congress & Exposition IMECE2014, pp. V014T11A007, Nov. 14-20, 2014, Montreal, Quebec, Canada**.
2. A. Sabau, W. D. Porter, A. Shyam, **Shibayan Roy**, 'Process simulation role in the development of new alloys based on integrated computational material science and engineering', **Proceedings of ASME 2014 International Mechanical Engineering Congress & Exposition, 2014**.
3. **Shibayan Roy**, S. Suwas, S. Tamirisakandala, R. Srinivasan, D.B. Miracle, 'Microstructure and texture evolution during  $\beta$  processing of hypoeutectic boron modified Ti-6Al-4V Alloy', **Proceedings of The 12<sup>th</sup> World conference on Titanium 2011, vol. 1, 689-693**.
4. **Shibayan Roy**, S. Suwas, S. Tamirisakandala, R. Srinivasan, D.B. Miracle, 'Processing response of boron modified Ti-6Al-4V alloy in ( $\alpha$ + $\beta$ ) working regime', **Supplemental Proceedings TMS 2009, vol. 3, 63-70**.

5. **Shibayan Roy**, N. Gurao, S. Suwas, S. Tamirisakandala, R. Srinivasan, D.B. Miracle, 'Texture evolution in boron modified Ti-6Al-4V alloy', **Proceedings of the 15th International Conference on Textures of Materials (ICOTOM 15), 2008.**
6. **Shibayan Roy**, 'Grain refined boron modified Ti-6Al-4V alloy: Role of Ti-B compound in texture evolution', **Proceedings of International Symposium for Research Scholars (ISRS) 2008, 203-207.**
7. **Shibayan Roy**, 'Microstructure evaluation of machinable mica-based glass ceramics for dental applications', **Proceedings of International Symposium for Research Scholars (ISRS) 2004.**

#### **Book and book chapter**

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1. S. Senthil Kumar, M. Thangarasu, Shibayan Roy, S. T. Reddy Aruna, 'Plasma Sprayed Ceramic Coatings for Solid Oxide Fuel Cells', in **Chapter 10: Advanced Ceramic Coatings for Energy Applications, In Press, Elsevier Publications, 2023.**
2. S. Roy, **Shibayan Roy**, 'New-Age Al-Cu-Mn-Zr (ACMZ) Alloy for High Temperature-High Strength Applications: A Review', in **Aluminium Alloys - Design and Development of Innovative Alloys, Manufacturing Processes and Applications, InTech Open Publications (2022).**
3. S. Sahoo, **Shibayan Roy**, 'Additive manufacturing of Titanium alloys: Microstructure and texture Evolution, defect formation and mechanical response', **Chapter 8: Additive manufacturing: A tool for industrial revolution 4.0, Elsevier Publications (2021).**
4. **Shibayan Roy**, "Boron Addition to Titanium Alloys: Microstructure & Texture Evolution", **LAP Lambert Academic Publishing, Germany, 2016.**
5. S. Suwas, D B Miracle, S Tamirisakandala, R Srinivasan, **Shibayan Roy**, 'Study of crystallographic texture during thermo-mechanical processing of boron modified Ti-alloys', **Ft. Belvoir: Defense Technical Information Center, USA, 2009.**
6. S. de-Waziers, **Shibayan Roy**, S. Suwas, S. Tamirisakandala, R. Srinivasan, D.B. Miracle, 'Solidification microstructure and texture in grain-refined titanium alloys', **Microstructure and Texture in Steels, Chapter 33 (2008) 475-483, Springer Publication.**

#### **Patents**

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- A. Shyam, Y. Yamamoto, D. Shin, **Shibayan Roy**, J. A. Haynes, P. Maziasz, A. Sabau, A. Rodriguez, J. A. Gonzalez, J. Talamantes, L. Zhang, S. Mirmiran, C. Glaspie, "Aluminum alloy compositions and methods of making and using the same", **US Patent Number US20170335437A1 (Granted in 2018).**