

## CURRICULUM VITAE

1. Name in full: Dr.-Ing. Jyotsna Dutta Majumdar

<p>2. <b>Address for Correspondence:</b>                  Professor (HAG)                  Department of Metallurgical and Materials                  Engineering                  IIT Kharagpur, West Bengal – 721 3012, INDIA                  Ph.: 03222 28 3288 (O)                        : 03222 28 3289 (R)/ 03222 220026 (R)                  FAX: 03222 55303, 77345                  e-mail: <a href="mailto:jyotsna@metal.iitkgp.ernet.in">jyotsna@metal.iitkgp.ernet.in</a>                        <a href="mailto:jyotsnadmajumdar@hotmail.com">jyotsnadmajumdar@hotmail.com</a>                        <a href="mailto:duttamajumdarjyotsna@gmail.com">duttamajumdarjyotsna@gmail.com</a></p>	
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3. **Nationality:** Indian (by birth).

4. **Academic Qualifications:**

Degree	Board/University	Major	Year
B. E.	Calcutta University (B. E. College)	Metallurgy	1990
M. Tech	I. I. T., Kharagpur	Metallurgical Engineering	1991
Ph.D	I. I. T., Kharagpur	Metal. Engg.	May, 1999
Dr.-Ing	T. U. Clausthal, Germany	Materials Science and Technology	December, 1999

5. Awards and/or Other Recognitions Received:

1. VASVIK Industrial Research Award, 2026
2. Fellow, Royal Society of Chemistry, UK, 2025 awarded by the Royal Society of Chemistry, UK.
3. Fellow, National Academy of Science India, 2024 awarded by the National Academy of Science India, Allahabad.
4. Visiting Professor Title awarded by the University of Northumbria, Newcastle, UK, July, 2023-2026
5. Fellow, International Association of Advanced Materials, Sweden, awarded by International Advanced Association of Materials, Sweden in December, 2022.
6. Excellence in Corrosion Science, awarded by the Association for Materials Protection and Performance, November 2022.
7. Institute Chair Professor, Indian Institute of Technology Kharagpur, August 2022.
5. Fellow, Indian National Academy of Engineering, 2021 awarded by Indian National Academy of Engineering, N. Delhi.
6. POWER Fellow, 2021, Science and Engineering Research Board (SERB), N. Delhi, India.

7. Fellow, Institute of Engineers, India, 2017.
8. Distinguished Woman in Engineering, 2017 by Venus International Foundation, Chennai in March, 2017.
9. Fellow, West Bengal Academy of Science and Technology, 2016
10. Friedrich Wilhelm Bessel Research Award under Alexander von Humboldt Foundation (AvH), 2015.
11. MRSI MEDAL – 2013, awarded by Materials Research Society of India,
12. 2012- Metallurgist of the Year, awarded by the Ministry of Steel, India.
13. DAAD Re-invitation fellowship to visit Institute of Materials Research – I, Karlsruhe Institute of Technology, Germany during May-July, 2012.
14. Bharat Jyoti Award, awarded by India International Friendship Society, 2011
15. Indira Gandhi Siromoni Award, awarded by India International Friendship Society, 2011
16. Elected as the Life Member, National Academy of Science, Allahabad
17. Editorial Board Member, Scientific Reports, a journal from Nature Publishing Group, 2012.
18. Editorial Board Member, International Journal of Emerging Technologies and Applications in Engineering Technologies and Sciences (IJ-ETA-ETS) and Lasers in Engineering
19. Lead Guest Editor, special issue on “Advances in Metallic Materials Processing” under Advanced Materials science and Engineering (Hinwai Publishing Corporation Ltd.)
20. Editorial Board Member, Lasers in Engineering, Oldcity Publishing House
21. 2<sup>nd</sup> best posters award on the paper entitled “Laser surface coating of Fe-Cr-Mo-Y-B-C bulk metallic glass composition on AISI 4140 steel” by M. Debnath, Anil Chikkam, N. B. Dahotre, Dutta Majumdar J. and I. Manna at the 64<sup>th</sup> Annual Technical Meeting awarded by the Indian Institute of Metals
22. 2<sup>nd</sup> best Posters award on the paper entitled “Laser Surface Nitriding of Ti-6Al-4V for bio-implant Application” by A. Biawas, U. K. Chatterjee, L. Li, I. Manna and Dutta Majumdar J. awarded by the Indian Institute of Metals.
23. Awarded Young Engineer Award – 2003 by the Indian National Academy of Engineering (INAE) for contribution in the field of Laser Surface Engineering.
24. Awarded BOYSCAST fellowship by the Department of Science and Technology (DST) to carry out research in Laser Material Processing at the University of Institute of Science and Technology (UMIST), UK, 2004.
25. Awarded a Young Scientist’s grant to carry out research under the FAST TRACK SCHEME of the Department of Science and Technology, 2002.
26. Awarded Young Metallurgist of the Year-2000 by the Ministry of Steel, India.
27. Selected as a Best Junior Researcher (among 47 under 35 worldwide) to participate and present a Paper entitled “Laser Surface Alloying - an Advanced Surface Modification Technology” in “Shaping the Future-Global Dialogue III (Science and Technology-Thinking the Future)” forum held in Hannover, Germany during July 9 to 13<sup>th</sup>, 2000.
28. ISCA Young Scientists’ Award (in the Materials Science Section) by the Indian Science Congress Association in the 87<sup>th</sup> Indian Science Congress, held in Pune during January 3-7, 2000.
29. Deutscher Akademischer Austauschdienst (DAAD) Fellowship, 1996-98. (for research work at the Technische Universität, Clausthal, Germany).
30. Research Associate-ship of Council of Scientific and Industrial Research to carry out research at IIT, Kharagpur, 1999, 1996; Senior Research Fellowship of Council of Scientific and Industrial Research for doctoral study at IIT, Kharagpur, 1995; Senior Research Fellowship of the Ministry of Human Resource Development for doctoral study at IIT, Kharagpur, 1992; Junior

Research Fellowship (JRF) and Eligibility for Lecturership (NET) of Council of Scientific and Industrial Research, 1991.

6. Members of Professional Bodies/Organizations:

- a. Life Member, Indian Institute of Metals (IIM)
- b. Life Member, Indian Science Congress Association (ISCA)
- c. Life Member, Indian Laser Association (ILA)
- d. Life Member, Materials Research Society of India (MRSI)
- e. Life Member, Indian Institute of Foundrymen (IIF)
- f. Life Member, National Association of Corrosion Engineers
- g. Member, American Society of Metals, USA, 2025
- h. Member, Royal Society of Chemistry, UK, 2024

7. Areas of Specialization/Interest: Surface Engineering; Corrosion and Environmental Degradation; Laser Materials Processing; Biomaterials; Advanced Processing of Materials

8. Professional experience:

Organization	Designation	Year		Nature of Experience
		From	To	
I. I. T. Kharagpur	Professor (HAG)	18.08.2019 till Date		Teaching and Research
I. I. T., Kharagpur	Professor	13.12.2011-	17.08.2019	Teaching and Research
Department of Mechanical Engineering Science (APK), Faculty of Engineering and the Built Environment (FEBE), University of Johannesburg	Visiting Professor	1 Jan. 2017-31 Dec. 2019		Talk once in a year and academic collaboration
Fraunhofer Institute of Laser Technology, Aachen	Visiting Scientist (under Friedrich Wilhelm Bessel Award Scheme)	3.06.15 to 03.12.2015	28.5.2019 to 29.6.2019	Research
Karlsruhe Institute of Technology, Germany	Visiting Scientist (under Friedrich Wilhelm Bessel Award Scheme)	11.5.18 to 15.7.2018		Research

Karlsruhe Institute of Technology, Germany	Visiting Scientist (under Friedrich Wilhelm Bessel Award Scheme)	1.6.19 to 30.6.2019	Research
CSIR, Pretoria, South Africa	Visiting Scientist	15.05.2009 to 15.07.2009	Research
I. I. T., Kharagpur	Associate Professor	12.4.2007-12.12.2011	Teaching and Research
Univ. of Chile, Santiago	Visiting Professor	17.06.07 to 30.11.07	Teaching and Research
I. I. T., Kharagpur	Assistant Professor	30.8.2000-11.04.07	Teaching and Research
UNIPRESS, Polish Academy of Science, Poland	Guest Scientist	15.05.06 to 14.07.06	Collaborative project under DST-PAS Exchange Program.
UNIPRESS, Polish Academy of Science, Poland	Guest Scientist	24.08.05 to 22.09.05	Collaborative project under DST-PAS Exchange Program.
Laser Processing Research Centre, UMIST, P O BOX 88 SACKVILLE ST MANCHESTER, M60 1QD United Kingdom	Academic visitor	13.01.04 to 28.06.04	Research
B. E. College, Howrah	Lecturer	31.3.2K to 26.8.2K	Teaching and Research
TU Clausthal, Germany	Guest Scientist	1.12.01 to 31.12.01, 10.07.2K to 19.07.2K, 15.4.2K to 15.5.2K, 15.11.2K to 15.12.2K	Research under DST-DAAD PPP program.
I. I. T., Kharagpur	Research Associate (CSIR)	1.04.99 to 30.3.2K	Post Doctoral Research
I. I. T., Kharagpur	Research Fellow (MHRD)	1.10.98 to 31.03.99	Doctoral Research
TU Clausthal, Germany	Guest Scientist	4.6.96 to 30.9.98	Doctoral Research under DAAD Sandwich Program
IIT, Kharagpur	Research Associate (CSIR)	1.2.96 to 31.5.96	Doctoral Research
IIT, Kharagpur	Senior Research Fellow (CSIR +MHRD)	27.1.92 to 31.1.96	Doctoral Research

## 9. Services Rendered to the Institute

1. Serving as Vice Chairperson and Chairperson, Central Research Facility during June, 2017 to November, 2017 and December 2017 to June, 2022.

2. Serving as the Presiding Officer and Member of the Appellate Body of the Internal Complaint Committee (July 2018 June 2021 and July 2021 to June 2024).
3. Served as the Professor in Charge, Central Time Table during 1<sup>st</sup> September, 2016 to 30<sup>th</sup> September, 2019.
4. Convened the 3<sup>rd</sup> International Conference on Laser and Plasma Application in Materials Science, 2015 (LAPAMS-2015) during 15<sup>th</sup> to 17<sup>th</sup> January, 2015 in Kolkata, India.
5. Organizing committee, 3<sup>rd</sup> EICOON SCHOOL on Science and Technology of Renewable and Clean Energy Sources. *April 30 – May 1, 2012*
6. Serving as the Warden of Ladies Hostel (RLB Hall of Residence) from October, 2009 to September, 2011.
7. Served as an Assistant Warden for the SN/IG/MT Hall of residence from January 2003 to December, 2004.
8. Acted as Convener to organize the Annual Technical Meeting of the Indian Institute of Metals held in Kolkata during Nov. 14-17, 2009; Convener to organize the Annual Conference on Materials Professionals involving Students, Industry and Teachers (COMPOSIT) during January 28-29, 2006 and March 17<sup>th</sup> to 19<sup>th</sup> 2007; Treasurer to organize the conference on 'Structure Property Correlation' during December 14<sup>th</sup> to 16<sup>th</sup>, 2008 sponsored by DAAD, N. Delhi; Treasurer to organize the International Conference on Advanced Materials and Materials Processing (ICAMMP) during Feb. 1-3, 2002 held at Indian Institute of Technology Kharagpur.
9. In-Charge, Optical Emission Spectroscopy Laboratory; In-Charge, Field Emission Scanning Electron Microscope.
10. Convened the short term course on 'Introduction to Materials and Materials Processing' as a subject for Graduate Engineers from Hindustan Aeronautics Ltd., held at I. I. T. Kharagpur during Autumn 2006 to Spring 2007.

#### 10 Services Rendered outside the Institute

1. Member, Sectional Committee-VII, INAE from December, 2022-till date
2. Member, Sectional Committee-IV, West Bengal Academy of Science and Technology, 2024-till date
3. Member, Sectional Committee-VII, INAE from December, 2022-till date
4. Asian Council Member, International Academy of Advanced Material (IAAM), 2024 till date.
5. Council Member, Indian Institute of Metals, during June 2016 to June 2019.
6. Project Assessment Committee (PAC) member of the Metallurgical, Mining and Minerals Engineering, Science and Engineering Research Board, N. Delhi, Year: 2018 till 2021, Advanced Research Grant from 2025 onwards.
7. Project Assessment Committee (PAC) member of the Empowerment and Equity Opportunities for Excellence in Science (EMEQ) scheme, Science and Engineering Research Board, N. Delhi, Year: 2021 till 2021 and from 2022 to 2025.
8. Project Assessment Committee (PAC) member of the Scientific and Useful Profound Research Advancement (SUPRA), Science and Engineering Research Board, N. Delhi, Year: 2022 till 2024.
9. Research Council Member, National Metallurgical Laboratory, September 2020 to September 2023.

10. Technical Advisory Group (TAG) meeting of the Centre for Laser Processing of Materials (CLPM) Member, year: 2021 to 2024.
11. Project Assessment Committee (PAC) member of the Empowerment and Equity Opportunities for Excellence in Science (EMEQUE), Science and Engineering Research Board, N. Delhi, Year: 2016 to 2019.
12. Co-Chair, 2nd International Conference on Sustainable Materials Processing and Manufacturing held in North West, Sun City Resort, South Africa, during March 8 to 10, 2019.
13. Co-Chair, 1st International Conference on Sustainable Materials Processing and Manufacturing held in Kruger National Park, South Africa, during January 23rd to 25th, 2017.
14. Session chair person, Session on Surface Engineering, thin film and coating, 3<sup>rd</sup> Asian Symposium on Materials and Processing held in I. I. T. Madras during 30-31<sup>st</sup> August, 2012.
15. Session chair person, Sessions on laser 1 and laser 2, 26<sup>th</sup> International Conference on Surface Modification Technology held in Ecully, Lyon, France during June 20<sup>th</sup> to 22<sup>nd</sup>, 2012.
16. External user and collaborator of the Macro-Nano facility, Karlsruhe Institute of Technology, Karlsruhe, Germany.
17. Member, Selection Board, Scientist Grade Selection, CGCRI, Kolkata, December, 2012.
18. Project evaluator, Qatar National Research Foundation (QNRF), Doha, Qatar, 2011.
19. Project reviewer, Department of Science and Technology, India.
20. External Examiner, PhD thesis, Indian Institute of Technology, Bombay, Powai, Yr.: 2012, 2016
21. External Examiner, PhD thesis, Monash University, Australia, Yr.: 2012, 2015
22. External Examiner, PhD thesis, Council of Scientific and Industrial Research, Pretoria, Yr.: 2011, 2014
23. External Examiner, PhD thesis, Visvesvaraya Technological University, Belgaum, Yr.: 2011.
24. External Examiner, PhD thesis, Homi Bhabha National Institute, IGCAR, Kalpakkam, Yr.: 2014, 2016.
25. M. Tech Thesis Examination, Dept. of Metall. Engg., Jadavpur University, Yr. 2010
26. Conducting SYNOPSIS seminar/viva, Bengal Engineering and Science University, 2010
27. Visiting faculty, University of Chile, Santiago, 2007 for 6 months (15<sup>th</sup> June to 28<sup>th</sup> Nov, 2010 on leave from Indian Institute of Technology Kharagpur)
28. Visiting Scientist, National Laser Centre, CSIR, Pretoria (15<sup>th</sup> May – 15<sup>th</sup> July, 2009)
29. Visiting Professor in the Department of Mechanical Engineering Science (APK), Faculty of Engineering and the Built Environment (FEBE), University of Johannesburg, 1<sup>st</sup> January, 2017 to 31<sup>st</sup> December, 2019.
30. Session chair-person, 2<sup>nd</sup> International Conferences on Laser and Plasma Application in Materials Science- 2010 held in Algier, Algeria.
31. Lead Guest Editor, special issue on Advances in Metallic Materials Processing an open axis Journal published by Hindwai Publishers, 2010
32. Member, editorial board, Lasers in Engineering, continuing since 2010
33. Member, editorial board, International Journal of Peening Techniques, 2016
34. Reviewer: Surface and Coating Technology, Materials Science and Engg. B, Tribology International, Metallurgical Transaction, Wear, Surface Engineering.

#### 11. SPONSORED RESEARCH AND CONSULTANCY

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Sl. No.	Title	Sponsor	Budget (INR)	Tenure (MM-YY) to (MM-YY)	Role (PI/ co-PI)
1.	Corrosion Resisting Test of Reinforcement of Existing Major Bridge on Kanchnalla and River Bhargavi	M/S Bhubaneswar Expressway PVT. LTD. (Registered Office: 37-38, Jain Bhawan 12, BHAGAT SINGH MARG, New Delhi-110001, India	110778	10-12 to 12-12	PI
2.	Development of Functionally Graded Metallic Components by Laser Materials Processing for Bio-implant Applications	DST, Govt. of India, Ministry of Science & Technology, Technology Bhawan, New Delhi-110016	97050000	03-12 to 02-15	PI
3.	Development of Compositionally Graded Coating on Marine Propeller for Improving Cavitation Corrosion Resistance	Naval Research Board, DRDO	3556000	04-09 to 03-12	PI
4.	Microstructural Characterization and its Optimization for Improved Weld Strength Fatigue Behaviour and Corrosion Resistance of Electron Beam Welded Materials for Atomic Energy Sectors	BRNS, DAE, MUMAI (BRNS SECURETRIAT, Department of Atomic Energy, Govt of India, Central Complex, 1st Floor, BARC, MUMBAI-400085	2259100	07-12 to 05-15	PI
5.	Development of Compositionally modulated thermal barrier coating by hybrid technology	KCSTC (Kalpana Chawla Space technology cell, IIT Kharagpur	1520000	09-13 to 10-16	PI
6.	Development of Aluminum Cenosphere Synatic Foam through spray forming technique for Aerospace Applications	Aeronaotics R&D Board ( Govt of India, ministry of defense directorate of aeronautics/ DRDO, Aeronaotics R&D board, DRDO BHAWAN, New Delhi-110105	2792035	12-12 to 03-17	PI

7.	Thermo Chemical Treatment on Porous Titanium and its Tribo-corrosion property evaluation for orthopedic application	Council of Scientific and Industrial Research, Extramural Research Division (CSIR Complex, PUSA, New Delhi-110012	223900	02-18 to 05-21	PI
8.	Development of porous bioactive titanium based composite for bio-implant applications	DBT, New Delhi (Government of India, Ministry of Science & Technology, Department of Biotechnology,	3215600	12-13 to 06-17	PI
9.	Functionally graded smart thermal barrier coating by combined plasma based hybrid processing and laser based 3-D printing on HS188 superalloy (imprint-2)	Science and Engineering Research Board (SERB), (Department of Science and Technology, New Delhi)	1500000	01-19 to 03-2023	PI
10.	Establishment of ultra short pulsed laser processing regime for surface treatment of titanium based implant for the tailored mechano-chemical property in simulated environment	Department of Science and Technology (DST) (Government of India, Ministry of Science & Technology, Department of Biotechnology (Technology Bhawan, New Delhi)	4274000	09-18 to 09-20	PI
11.	Development of nano-structured CoNiCrAlY bond coat by HVOF spraying for thermal barrier coating application	KCSTC (Kalpana Chawla Space technology cell, IIT Kharagpur	2985200	05-18 to 05-21	PI
12.	DEVELOPMENT OF MICROSTRUCTURALLY, COMPOSITIONALLY AND FUNCTIONALLY GRADED COMPONENTS BY LASER ASSISTED MATERIALS PROCESSING	DST, Govt. of India, Ministry of Science & Technology, Technology Bhawan, New Delhi-110016	65800800	07-18 to 03-23	PI
13.	DEVELOPMENT OF A GRADED COMPOSITE SURFACE ON BETA TITANIUM ALLOY (Ti3Nb13Zr) FOR IMPROVED TRIBO-CORROSION PROPERTY BY HYBRID LASER COMPOSITE	Science and Engineering Research Board (SERB), (Department of Science and Technology, New Delhi)	3540000	03-21 to 03-25	PI

	SURFACING AND LASER SURFACE TEXTURING				
14.	CHARACTERIZATION OF PLASMA SPRAYED Al <sub>2</sub> O <sub>3</sub> AND Y <sub>2</sub> O <sub>3</sub> ON ANODIZED ALUMINIUM UNDER THE INFLUENCE OF HYBRID PLASMA SPRAY DEPOSITION WITH LASER GLAZING (PSY)	LAM Research	18577620	09-21 to 03-23	PI

## 12. COURSE TAUGHT

- a. Surface Engineering (theory, undergraduate (Bachelor of Tech.) and postgraduate level (Mater of Tech., Post Graduate Diploma in Steel Technology).
- b. Joining of Metals (Theory, Undergraduate)
- c. Corrosion and Surface Degradation (theory, undergraduate).
- d. Diffusion in Solids (theory, undergraduate and postgraduate level).
- e. Introduction to Materials for non-metallurgist (theory, undergraduate).
- f. Phase transformation and heat treatment (laboratory, undergraduate level)
- g. Physical Metallurgy (laboratory, undergraduate)
- h. X-ray and Electron Microscopy (laboratory, undergraduate)
- i. Offered online course on “Surface Engineering for Wear and Corrosion Resistance Application” under Massive Open Online Courses (MOOC) program jointly with Prof. I. Manna.

## 13. DEVELOPMENT WORK DONE

1. Developed a surface engineering laboratory (in collaboration with Prof. I. Manna) well equipped with surface cleaning, coating and wear and corrosion testing facilities.
2. Developed Electron Beam Welding Laboratory as a Co-Investigator in collaboration with Prof. G. L. Dutta, Prof. I. Manna, Prof. G. G. Roy and BARC, Bombay (funded by BARC, Bombay)
3. In the process of Development of Thermal Spraying Laboratory (funded by Naval Research Board and Department of Science and Technology)

## 14. LABORATORIES HANDLED

Phase Transformation and heat treatment (laboratory, UG level)  
 Physical Metallurgy (laboratory, UG level)  
 X-ray and Electron Microscopy (laboratory, UG level)  
 Metallurgy for non-metallurgists (Laboratory, UG level)

Mechanical Metallurgy (Laboratory, UG level)  
Training and Seminar (Seminar, UG level)  
Heat Treatment (Laboratory at the UG level)

15. RESEARCH GUIDANCE

a. Guidance at the doctoral level

Completed

1. Anupama Dutta (2025)  
Area of Research: Advanced Processing of Materials  
Thesis Title: Studies on Titanium Aluminides and its Composites Developed by Laser Direct Energy Deposition
2. Aakash Rathore (2025)  
Area of Research: Advanced Joining of Materials  
Thesis Title: Studies on Electron Beam Welding of Aluminium, Austenitic Stainless Steel (AISI304SS), and P91 Steel in Similar and Dissimilar Combinations
3. Harikrishnan R (2025)  
Area of Research: Laser Shock Peening  
Thesis Title: Effect of Laser Shock Peening on Mechanical and Corrosion Properties of Laser-Powder Bed Fusion Manufactured 15-5 Precipitation Hardening Stainless Steel
4. Manoj Kumar (2025)  
Area of Research: Advanced Processing of Materials  
Thesis Title: Development of Gd<sub>2</sub>O<sub>3</sub> Doped YSZ based Thermal Barrier Coating and Intermetallic Dispersed Composite Coating on Inconel 718 for High Temperature Application
5. Sharath A. (2025)  
Area of Research: Welding of Materials  
Thesis Title: Studies on Laser Surface Melting and Laser Direct Energy Deposition of AISI 316L Stainless Steel and IN718 by Fiber Laser
6. Shree Krishna (2025)  
Area of Research: Nanostructured Materials  
Thesis Title: Multicomponent Alloy and Composite Surface on AISI 316L Stainless Steel by Laser Surface Alloying for Improved Wear and Corrosion Performance
8. Jeetendra Kumar Singh (2024)  
Area of Research: Advanced Joining of Materials  
Thesis Title: Studies on Electron Beam Welding of Titanium (CP Ti), its alloys (Ti6Al4V) and Niobium (Nb)
9. Madapana Dileep (2024)  
Area of Research: Surface Engineering of Biomaterials

- Thesis Title: Studies on Laser Surface Structuring and Laser Shock Peening of Ti6Al4V and its effects on Corrosion and Tribocorrosion Properties for Bioimplant Applications
10. Amarish Kumar Shukla (2022)  
Area of Research: Advanced Materials Processing  
Thesis Title: Development of Aluminum Foam by Stir Casting, Powder Metallurgy, and Spray Forming Routes and its Performance Evaluation
  11. Amitesh Chakraborty (2021)  
Area of Research: Surface Engineering  
Thesis Title: Effect of Binder Composition and Process Parameters on Laser Composite surfacing of AISI 304 Stainless Steel with WC
  12. Sumit Kumar Sharma (2020)  
Area of Research: Surface Engineering  
Thesis Title: Studies on Electron Beam and Laser Surface Melting and Welding of INCONEL
  12. Kalinga Simant Bal (2019)  
Area of Research: Laser material processing  
Thesis Title: Uniaxial Tensile Strength and Susceptibility to Intergranular Corrosion of Hastelloy C-276 Sheets Welded by Ytterbium-fiber Laser Beam and Electron Beam
  13. Monoj Kumar Debnath (2018)  
Area of Research: Development of nanocrystalline coating by PIII  
Thesis Title: Studies on Improvement of Wear and Corrosion Resistance of Interstitial Free Steel by Plasma Nitriding and Sputtering
  14. Renu Kumari (2017)  
Area of Research: Corrosion and Surface Protection  
Thesis Title: Surface Modification and Coatings on Titanium based Alloy (Ti-6Al-4V) for Bioimplant Application
  15. Arun Kumar (2016)  
Area of Research: Surface Engineering"  
Thesis Title: Surface Engineering of AISI 316L Stainless Steel for Bioimplant Application
  16. Prashant Sharma (2016)  
Area of Research: Thermal spray coating for thermal barrier application.  
Thesis Title: Development of NiCrSiB Coating on AISI 304 Stainless Steel for Hot Corrosion Resistance and La<sub>2</sub>O<sub>3</sub>-YSZ Composite Coating on Inconel 718 for Thermal Barrier Applications
  17. Subhasisa Nath (2015)  
Area of Research: Surface Engineering  
Thesis Title: Studies on Compositionally Graded Thermal Barrier Coatings Developed by Thermal Spraying and Pulsed Laser Deposition

18. Mr. Gururaj Telasang (2014)  
Area of Research: Surface Engineering  
Thesis Title: Development of Functionally Graded Component by Direct Laser Fabrication  
(Name of the scholar:, Collaborator: Prof. Indranil Manna, Year: 2014)
19. Mr. Swapan Karak (2013)  
Area of Research: Surface Engineering  
Thesis Title: Development of Oxide Dispersion Strengthened Ferritic Steel by Mechanical Alloying and Subsequent Processing
20. Dr. Satyajit Chatterjee (2010)  
Area of Research: Surface Engineering  
Thesis Title: Development of Al<sub>2</sub>O<sub>3</sub>-TiB<sub>2</sub>-TiN Composite Coating by Self-Propagating High-Temperature Synthesis and Laser Surface Alloying
21. Dr. Amit Biswas (2009)  
Area of Research: Surface Engineering  
Thesis Title: Surface Engineering of Ti-6Al-4V for Bio-implant Application
22. Dr. Anindya Basu (2007)  
Area of Research: Surface Engineering  
Thesis Title: Studies on Surface Nitriding of 52100 Steel for Bearing Application
23. Dr. B. Ramesh Chandra (2007)  
Area of Research: Surface Engineering  
Thesis Title: Development of Compositionally Graded Coating by Laser Surface Engineering (Name of the candidate:.. Collaborator: Prof. Indranil Manna. Year: 2006)

Continuing

1. Development of Nano-structured High Entropy Alloy for Structural Application  
(Name of the scholar: Turin Dutta)
2. Development of Nano-structured Coating for High Temperature Application  
(Name of the scholar: Annada Dash)
3. Development of Nano-structured Surface on Ti6Al4V for High Bio-implant Application  
(Name of the scholar: Tarun Gayen)
4. Development of Nano-textured Surface for Bio-implant Application  
(Name of the scholar: Bipasha Basu)
5. Laser Surface Cladding of Aluminium Based Alloys  
(Name of the scholar – Bidipta Dam)
6. Laser Surface Processing of beta titanium alloys  
(Name of the scholar – Tapas Bera)
7. Laser surface processing of multicomponent systems of Ti-alloys  
(Name of the scholar – Abhinay Rajput)
8. Laser surface processing of metallic glass coatings systems  
(Name of the scholar – Kishan Kumar)
9. Laser Surface Engineering of Magnesium and its Alloys  
(Name of the scholar – Barsha Nag)

b. Guidance at the Masters level, M. Tech  
Completed

1. Some studies on Surface Modification of Mg Alloys by Laser and Ion Beam Techniques, Name: A. Krishna Mohan (year: 2001. Collaborator: Prof. S. K. Roy)
2. Laser Composite Surfacing of Magnesium with SiC, Al<sub>2</sub>O<sub>3</sub> and WC, Name: B. Ramesh Chandra (Year: 2002)
3. Studies on Residual stress Developed in Laser Surface Alloying, Name: N. K. Sukhdeve (Year: 2002)
4. Studies on Laser Surface Melting of Steels, name: S. S. Bhoyar (Year: 2003)
5. Studies on Laser Surface Melting and Nitriding Of AISI 52100 Ball Bearing Steel, Name: Angad Kumar Churendra (Year: 2006. Collaborator: Prof. Indranil Manna)
6. Characteristics and Properties of Direct Laser Clad Layer for Bio-implant Application, Name: Ajeet Kumar (Year: 2007)
7. Studies on TiB Dispersed Ti and AISI 316L Stainless Steel Developed by Direct Laser Cladding for Bio-implant Application, Name: Dilip sarkar (Year: 2007).
8. Studies on Thermal Oxidation Of Ti-6Al-4V and Mg-Alloy (AZ91) For Improving Biocompatibility, Name: Upamanyu Bhattacharyya (Year: 2007. Collaborator: Prof. Indranil Manna).
9. Surface Engineering of Interstitial Free Steel and Low Alloy Steel, Name: Anil Chikkam (Year: 2008. Collaborator: Prof. Indranil Manna)
10. Electron Beam Assisted Surface Engineering of Low Alloy Steel and Zircaloy, Name: Y. B. Patil (Year: 2008. Collaborator: Prof. Indranil Manna).
11. Surface engineering for bioimplant application, Sarat (Year: 2009)
12. Electron-beam assisted hardening and welding of materials, Shilani (Year: 2009. Collaborator: Prof. G. G. Roy)
13. Surface Engineering of steel for Defence Application (Name: Mr. Arun Kumar, Collaborator: Sanjeev Kumar Bhola , Director, ODC, Kanpur)
14. Studies on Oxidation Behavior of Oxide Dispersed Ferritic Steel, Name: Rohit Satapathy (Year: 2010. Collaborator: Prof. I. Manna)
15. Laser Surface Alloying of AISI 304 Stainless Steel with WC+Ni+NiCr for Improved Wear Resistance (Name: Mr. S. Anandan, Yr.: 2011))
16. Development of Nano-structured alumina (Al<sub>2</sub>O<sub>3</sub>), ceria stabilized zirconia (CSZ) and titania (TiO<sub>2</sub>) by mechanical alloying and subsequent processing (Name: Mr. Monobala, Collaborator: Prof. I. Manna, Yr.: 2011).
17. Electron Beam Surface Melting of Austenitic Cr-Mn Stainless Steel: Process Optimization, Kabiraj Pradhan (Yr.: 2013)
18. Study of Cyclic Oxidation Behaviour of Thermal Barrier Coatings by Plasma Spraying, Kartik Bhandari (2013).
19. Effect of Grain Size on the Characteristics and Performance of CoNiCrAlY Bond Coat for Thermal Barrier Applications, Rajesh. A (Yr.: 2013)
20. Synthesis and characterization of ZnO, Fe<sub>3</sub>O<sub>4</sub> and ZnO/Fe<sub>3</sub>O<sub>4</sub> nanostructures at different pH values, Ankur Sisodia (Yr. 2014)
21. Laser surface alloying of Fe<sub>48</sub>Cr<sub>15</sub>Mo<sub>14</sub>Y<sub>2</sub>C<sub>15</sub>B<sub>6</sub> (at.%) on AISI 4130 structural steel and Fe<sub>65</sub>Cr<sub><10</sub>Mo<sub><14</sub>Y<sub>2</sub>C<sub><5</sub>B<sub><5</sub> on AISI 4140 steel for improving wear & corrosion resistance, Ganesh Gavali (12MT61R36) (2014)
22. Studies on Pulse Electrolytic Oxidation on Commercially Pure Magnesium, KOLLA RAJASHEKAR (2014)

23. *Study on Laser Surface Alloying on Ti-6Al-4V with Mo<sub>2</sub>C and Mo<sub>2</sub>C + MoS<sub>2</sub> by preplaced powder technique, Preeti Priya (Yr. 2014).*
24. Studies on Characterization and Mechanical Properties of Titanium Cenosphere Syntactic Foam Developed by Powder Metallurgy Route, S. V. Singh Chauhan (Yr. 2014).
25. *Studies on electron beam surface melting of Ti-6Al-4V, Manoj Kumar (Yr: 2015).*
26. *Study on Electron Beam Surface Melting of AISI 304 Stainless Steel, by Abhishek Chandwani,(Yr. 2015)*
27. Studies on Mechanical properties of Aluminium Cenosphere Syntactic Foam Developed by Powder Metallurgy Route, Kaustabh Khot (Yr. 2015).
28. *Characterization and Electrochemical Property Evaluation of Aluminium Cenosphere Syntactic Foam by Powder Metallurgy Route, Rajgire Shanmukh Harishchandra (Yr: 2015).*
29. Electron Beam Welding of Inconel 718, Prashant Agarwal, (Yr. 2016)
30. [Structural Materials for Nuclear Energy Application: Corrosion Studies and Surface Enhancement by Electron Beam Melting \(EBM\), Soumyabrata Basak, IIT Bhubaneswar, \(Yr. 2016\)](#)
- 31, Studies on Thermal Oxidation of Ti-6Al-4V for bio-implant Application, Ashutosh Tiwari (Roll No.16MT61R57), Yr.: 2017.
- 31, Studies on Anodizing of Ti-6Al-4V for bio-implant Application, Ashutosh Tiwari (Roll No.16MT61R57). Yr.: 2017
32. Study on Plasma Electrolytic Oxidation of Magnesium Alloys and Titanium Alloys for Biomedical Applications, Shweta Lata Ekka (Roll No: 16MT61R26) Yr.: 2017

### M. S. Thesis

1. Laser Assisted Fabrication of Hip and Femoral Prosthesis (year: 2006. collaborator: Prof. I. Manna)

b. Guidance at the Undergraduate level

B. Tech (completed)

1. Theoretical Model to Predict Residual Stress Developed in Laser Surface Hardening, Name: Nishant Tewari (Yr.: 2002).
2. Mathematical Modeling of Heat Transfer in Laser Surface Hardening, Name: Aniruddha Ghosh (Year: 2002).
3. Some Studies on Laser Surface Alloying of a Mg Alloy (AZ91), Name: Praveen Kumar (Yr. 2003).
4. Laser Bending of Stainless Steel, Name: Somak Roy (Year: 2003)
5. Laser Surface Alloying of Armacor on mild steel for improved wear property (Yr. 2004. collaborator: Prof. I. Manna)
6. *Laser Surface Alloying of Mild Steel for Wear Resistance Application, Name: Ajit Kumar Jain (Year: 2006)*
7. Particle Dispersion by Laser Surface Engineering on Metals and Alloys for Tribological Studies, Name: Deepanjan Biswas (year: 2006)
8. Surface Modification of Titanium alloys and Stainless Steel for bio-medical applications, Name: P. V. S. Srikant (Year: 2007)

9. Studies on Laser Surface Melting of Al-Si Alloy for Improving Wear Resistance, Name: Subrata Das (Year: 2007).
10. Development of Wear-resistant of Cu-alloy with Nano-Ceramic Oxide Dispersion by Mechanical Alloying and Sintering for Electrical Contacts. Name: Rajesh Kumar Mesram (Year: 2007. collaborator: Prof. I. Manna).
11. Surface treatment of Mg AM50 alloy and Cu-Al-Mn Shape Memory Alloy for Corrosion and Wear Resistant Applications. Name: Arjit Gautam (Year: 2008. collaborator: Prof. I. Manna)
12. Surface Treatment of Steel and Cu-Al-Mn Alloys for Wear Resistance Application, Name: Sujoy Kumar (Year: 2008. collaborator: Prof. I. Manna).
13. Surface Engineering of Cu-based shape memory alloy for corrosion resistance application, Ankit (Year: 2009)
14. Surface Engineering of Cu-based shape memory alloy for corrosion resistance application, Ankit (Year: 2009)
15. Studies on Oxidation Behavior of Oxide Dispersed Ferritic Steel, Name: Ansul (Year: 2010. Collaborator: Prof. I. Manna)
16. Surface Engineering of IF Steel for wear and Corrosion Resistance Application. Name: Jayakanth (Year 2010. Collaborator: Prof. I. Manna))
17. Effect of Cold Deformation of Mechanical and Electro-Chemical Properties and Nitriding Kinetics of AISU 304 Stainless Steel (Name: Devendra, Year: 2011).
18. Electron Beam Surface Melting of AISI 304 Stainless Steel for improved Intergranular Corrosion Resistance (Name: Ishan, Year: 2013).
19. Development of Amorphous Coating on Steel by Laser Surface Cladding(Name: Vivek Kumar, Yr.: 2013).
20. Electron Beam Welding of Materials - Present Status (Name: Virendra Singh, Yr.: 2014).
21. Laser Shock Peening of Steel, Bobbili Swetha (Yr.: 2013)
22. Studies on Effects of Surface Roughness on Wear Behaviour of Electron Beam Melted AISI 304 Stainless Steel, Animesh Lahiri (Yr.: 2014)
23. Improving corrosion resistance of IF steels by Sputter deposition, GAURAV NYATI (2015)
24. Studies on Electron Beam Melting of sensitized AISI304 Stainless Steel, Rakesh Kumar Sahoo (2015)
25. Studies on Electron Beam Welding to Optimize the Parameters Ravi Kumar Verma (2015).

#### Post Graduate Diploma in Steel Technology, PGDST (Completed)

1. Surface Engineering of Low Nickel Austenitic Stainless Steel, Name: L. Sivakumar (year: 2008)
2. Surface Treatment of Mild Steel for Improved Wear and Corrosion Resistance, Nilu Kumar and P. Udaya Bhanu (Year: 2008)

## **Research Contribution** **(From 13<sup>th</sup> Dec. 2011 till date)**

### **1. Laser Assisted Microprocessing of Materials**

A high energy density pulsed laser may be used to microprocess materials by ablation, melting and plasma formation. Prof. Dutta Majumdar has contributed significantly on laser surface texturing of titanium, and laser shock peening of steel in collaboration with Karlsruhe Institute of Technology, Karlsruhe, Germany. The notable contributions of the work may be summarized as follows:

#### **Understanding the effect of texturing morphology on the properties (mechanical, electrochemical and biocompatibility) of Ti-6Al-4V.**

Laser surface texturing of Ti-6Al-4V has been carried out by ArF excimer laser at a wavelength of 193 nm with a pulse length of 5 ns in Air. Laser surface texturing leads to form a uniform, defect free and periodic textured patterns with dimples and linear grooves with gap. Microstructure of textured zones shows the refinement of grain along with presence of  $\alpha$ ,  $\beta$  rutile, anatase and few  $Ti_2O_3$  phase. There is a significant improvement in nano-hardness, and young's modulus in the textured surface, however improvement is higher in dimple textured surface. There is an improvement in wear resistance of Laser textured surface. A significant improvement in wettability after laser surface texturing. The total surface energy is decreased due to linear (29.6 mN/m) texturing and increased due to dimple (67.6 mN/m) texturing as compared to as-received Ti-6Al-4V (37 mN/m). The effect of polar component is more in influencing the surface energy of textured surface. There is a significant improvement in bioactivity in terms of calcium phosphate deposition rate in Hank's solution. XTT result shows, comparable cell viability of laser textured sample as that of as received Ti-6Al-4V. Cell attachment study shows a reduced cell density in textured surface with a maximum reduction in dimple textured surface. Cells aligned themselves along the direction of texturing in linear textured surface. It was the pioneering attempt and report when it was observed that morphology plays an important role in determining the surface wettability and bio-compatibility [45,47]. In addition, the effect of laser wavelength on texture morphologies and the properties of the textured surface was established [9].

### **2. Development of Titanium Aluminide and its Composite by Direct Laser Cladding**

Direct laser cladding aims at development of product by one step processing by melting materials in the form of powder or wire and depositing it on the surface of substrate in a layer by layer fashion to develop the whole component [7,22]. Direct laser cladding has successfully been applied to develop titanium aluminide and its composites. Technologies for the improving the fracture toughness and ductility of the titanium aluminide has been proposed which will soon be applied for patent.

### **3. Development of graded thermal barrier coating**

Functionally graded TBC has a flexibility in depositing different numbers of interlayers by varying the composition of the composite powders for combining the benefits of graded coating architecture with the individual material property. Functionally graded TBC has demonstrated properties such as microhardness, elastic modulus, microstructure, density, thermal conductivity, coefficient of thermal expansion and diffusivity, change gradually over the thickness which is appropriate for improving the thermal and mechanical properties of the coatings. YSZ based graded thermal barrier coating was developed on INCONEL 718 substrate and a detailed investigation of microstructural characterization, evaluation of thermal, nano-mechanical and high temperature oxidation resistance properties and compared with YSZ coated substrate without any gradation. It has been observed that a gradual variation in composition along the coating thickness eliminates the formation of sharp interface between coating layers which has also a beneficial effect in reducing the residual thermal stress in the coating [30, 36, 37, 38, 59, 62, 72]. Oxidation behavior (both isothermal and cyclic) of compositionally graded thermal barrier coating (TBC) consisting of 100% CoNiCrAlY as bond coat developed by high velocity oxyfuel (HVOF) spraying on Inconel 718 substrate followed by several layers of CoNiCrAlY and YSZ in the weight ratios of 70:30, 50:50, 30:70, and 0:100 by plasma spraying. The kinetics of growth of the thermally grown oxide (TGO) layer developed due to oxidation of compositionally graded TBC was compared to the same grown during oxidation of conventional duplex TBC. The mechanism of oxidation was established. The residual stress developed on the surface before and after oxidation was studied in details.

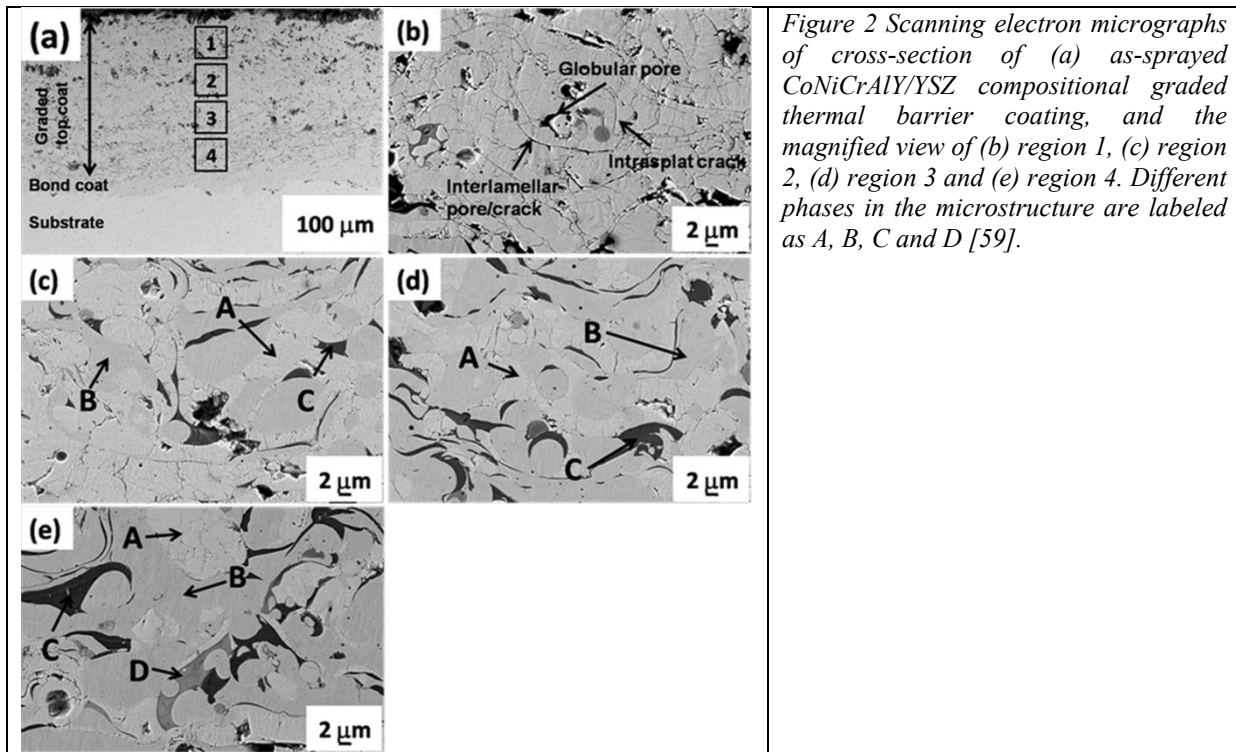


Figure 2 Scanning electron micrographs of cross-section of (a) as-sprayed CoNiCrAlY/YSZ compositional graded thermal barrier coating, and the magnified view of (b) region 1, (c) region 2, (d) region 3 and (e) region 4. Different phases in the microstructure are labeled as A, B, C and D [59].

#### 4. Electron beam assisted materials processing

Electron beam welding set-up was established in collaboration with Prof. G. L. Dutta, Prof. I. Manna and Prof. G. G. Roy in the year 2010. Substantial efforts were undertaken to study the effect of electron beam welding on joining of nickel based alloys (Inconel718 and Hastelloy C276), Aluminium, stainless steel to aluminium, titanium to titanium, and niobium. Electron beam was also applied for the surface melting of Inconel718, and steel. Notable outcome of the studies in this field include:

## Electron beam melting and welding of INCONEL 718

In this study, the effect of electron beam processing (surface melting and welding) of Inconel 718 on its microstructure, mechanical properties and electro chemical properties. Electron beam melting leads to formation of defect free microstructure with the depth of melting varying from 240  $\mu\text{m}$  to 720  $\mu\text{m}$  and decreases with increase in scan speed. The microstructure of the melt zone is having dendritic morphology and consists of gamma ( $\gamma$ ) and gamma prime ( $\gamma'$ ) phases. Electron beam melting introduces residual compressive stress (-180 MPa to -1000.21 MPa) which varied with process parameters. Due to electron beam melting, there is increase in surface hardness from 278 VHN for as received Inconel 718 to 300 to 950 VHN for electron beam melted Inconel 718. Maximum microhardness is observed at a depth below 100 to 200  $\mu\text{m}$  from the surface. Microhardness was also found to vary with heat input parameters. The optimum process parameters of electron beam melting corresponding to development of defect free microstructure with presence of compressive residual stress below yield strength. Due to electron beam melting, there is a significant decrease in corrosion rate with a maximum decrease observed for the samples melted with a scan speed of 1000 mm/min. The pitting corrosion resistance remained unaffected because of electron beam melting. Electron beam melting caused a marginal decrease in wear kinetics and wear coefficient [8,12].

Electron beam welding was successfully applied to weld Inconel 718 of thickness 3 mm. the microstructure was dendritic with the presence of gamma ( $\gamma$ ) and gamma prime ( $\gamma'$ ) and gamma double prime ( $\gamma''$ ) phases. There is improvement in microhardness due to electron beam welding (471.6 VHN to 520.5 VHN) as compared to as received Inconel 718. A detailed studies of the mechanical properties shows that there is reduction in strength and percentage elongation due to electron beam welding as compared to base metal. Though the corrosion rate in 3.56 wt.% NaCl solution was reduced due to laser surface melting, however, pitting corrosion resistance was improved due to laser surface melting [31].

## **Understanding the effect of electron beam welding parameters on welding of Hastelloy C276 [1,16,18]**

In this investigation, the effect of electron beam parameters on the micro-structure, micro-hardness, and corrosion resistance of the weld zone of electron beam welded Hastelloy C-276 sheet has been carried out. Microscopic study showed formation of a defect free microstructure with cellular dendritic morphology and free from segregation. A detailed phase analysis shows no significant variation of phases with process parameters, but a marginal variation in texture coefficient of the individual plane was observed. The micro-hardness of the weld zone was found to be same as that of the base metal. Corrosion resistance of the weld zone was found to be improved which is attributed to microstructural refinement and homogenization due to electron beam surface melting.

## 5. Laser Welding of Materials

### Laser Welding of Inconel 718

Laser Surface melting offers a defect free melt zone with depth varying from 388  $\mu\text{m}$  to 453  $\mu\text{m}$ . In the microstructure, there is presence of gamma double prime ( $\gamma''$ ) phase in addition to gamma ( $\gamma$ ) and gamma prime ( $\gamma'$ ) phases. The microhardness of the melted zone was found to vary from 425 VHN to 475 VHN. A detailed electron back scattered diffraction (EBSD) analysis was conducted to understand the grain size and its distribution, grain boundary rotation angle, and texture. Laser surface melting with the parameters (750 mm/min) shows a minimum wear kinetics under steady state wear. Wear coefficient was also found to vary with laser parameters and a minimum wear coefficient was observed when laser melted using scan speed 500 mm/min and power of 400 watt. Wear rate was found to be reduced due to laser surface melting and decreased with increase in scan speed.

. Laser beam welding leads to marginally decrease in hardness for all the parameters except a few. There is a significant decrease in nano hardness and young modulus but increase in toughness due to laser welding. A detailed crystallographic texture was studied by EBSD analysis to know the crystallographic orientation.

### Laser Welding of Hastelloy C276 [13,14,20,21,23,24]

Bead-on-plate welding of 2.7 mm thick Hastelloy C-276 sheets was carried out by Ytterbium optical fiber laser to study the effect of input parameters on the melt zone cross-sectional geometry. There was no significant difference in micro-hardness of the weld zone as compared to the base metal. Scanning Electron Microscopy showed formation of grains of different structures as well as orientation at the melt zone followed by negligible changes in the grain size at heat affected zone as compared to the base metal. Energy-dispersive X-ray spectroscopic analysis of melt zone showed negligible changes in elemental concentration between sub-grain structure and intra- sub-grain spacing. X-ray Diffraction analysis of melt zone showed reduction in peak intensity of austenitic  $\gamma$ -phase for melt zone when compared with the base metal. Finally based on the analysis of variance study and full penetration criteria, a proposal for selection of parameters for laser beam welding experiment has been made. The detailed study of the intergranular corrosion behavior of the welded sample was carried out.

## 6. Plasma spray deposition of bio-active coating on Ti6Al4V and effect of post heat treatment on properties [26,28,29]

Plasma spraying has been used to deposit a monolithic  $\text{TiO}_2$  and hydroxylapatite based composite ( $\text{HA}+50\%\text{TiO}_2$  and  $\text{HA}+10\% \text{ZrO}_2$ ) coatings on Ti-6Al-4V. Followed by coating post heat treatment have been applied at 550°C for  $\text{TiO}_2$ , at 650°C for  $\text{HA} +50\% \text{TiO}_2$  and at 750 °C for  $\text{HA}+10\% \text{ZrO}_2$ . Plasma spray coated surface shows the presence of porosity and un-melted particles on the surface, the area fraction of which decreases after heat treatment. X-ray diffraction analysis shows the phase transformation from anatase (in precursor powder) to rutile (in as-sprayed coating and the same after heat treatment) in the  $\text{TiO}_2$  coated surface. HA based composite coating shows decomposition of HA and formation of  $\text{CaTiO}_3$  phase in the composite  $\text{HA} + 50 \text{ wt}\% \text{TiO}_2$  coating and presence of  $\text{CaZrO}_3$  phase in the  $\text{HA}+10 \text{ wt}\% \text{ZrO}_2$  coating. There is an improvement in hardness after post heat treatment as compared to as sprayed coating, 4.6 GPa to 4.8 GPa in  $\text{TiO}_2$

coating, 2.15 GPa to 2.2GPa in HA+50wt% TiO<sub>2</sub> and 1.1GPa to 2.3 GPa in HA + 10wt% ZrO<sub>2</sub>.A significant improvement in wear resistance and corrosion resistance of heat treated sample as compared to as sprayed sample. Bioactivity in terms of calcium phosphate deposition is better in as sprayed coating.

## **7. Bio-active Coatings by Plasma Electrolytic Oxidation [46]**

Plasma electrolytic oxidation (PEO) was proven to be an effective route to develop thick (150 μm) and porous (35 %) oxide film on the surface of Ti-6Al-4V consisting of anatase, rutile, calcium phosphate and SiO<sub>2</sub> phases. There is a significant improvement in hardness, wear resistance and corrosion resistance. PEO treated surface shows a significant improvement in wettability in terms of decrease in contact angle from 60 ± 1.5 to 45 ± 1 deg.

## **8. Femto-second laser processing of materials [39]**

In the present study, laser shock peening has been attempted on 0.4% C steel using a femtosecond laser under varied process parameters. Laser processing leads to formation of martensite along with ferroto-pearlitic phase in the microstructure. Due to laser processing, there is introduction of residual stress on the surface which varies from high tensile (520.6 MPa) to compressive (-330 MPa) as compared to 152 MPa of as received substrate. There is a significant increase in hardness to 350-500 VHN as compared to 250 VHN for as-received substrate. A detailed study of fretting wear behavior against hardened steel ball shows that there is a significant reduction in wear depth due to laser processing, which is attributed to increase in hardness of the surface. There is also decrease in coefficient of friction against hardened steel ball, which is due to increased hardness and partial smoothing of the surface due to laser processing. Laser processing under optimum process parameter improves the corrosion resistance in terms of decrease in corrosion rate as compared to as-received substrate.

## **9. Laser Surface Melting and Gas Nitriding of Ti-6Al-4V for bio-implant application [103,113,117,121,123,134].**

The present study aims at enhancing the biocompatibility of Ti-6Al-4V by laser surface nitriding. Laser surface nitriding has been carried out by melting of sand blasted Ti-6Al-4V substrate using a high power continuous wave DIODE laser with nitrogen as shrouding environment (at a pressure of 5 l/min). Following laser treatment, a detailed characterization of the surface has been conducted. Microhardness and biocompatibility have been evaluated. Laser surface nitriding led to formation of dendrites of TiN on the surface. The microhardness is improved to 900-950 VHN (in laser surface nitriding) as compared to 260 VHN of as-received substrate. Biocompatibility behavior showed a better cell viability in laser surface nitrided Ti-6Al-4V sample as compared to as-received one.

## **10. Development of Coating for hot Wear, and hot corrosion resistance application by hybrid HVOF spraying and laser melting [48,60,78,80]**

In this study, coatings were developed for hot corrosion resistance of AISI 304 stainless steel (C 0.08%, Cr 18%, Fe 66%, Mn 2%, Ni 8%, P 0.04%, S 0.03%, Si 1%) by hybrid thermal spray deposition ad laser surface melting techniques. Thermal spray deposition of nickel based hard faced alloy (68.4Ni-17Cr-3.9B-4.9Si-5.8Fe) has been carried out on sandblasted AISI 304 stainless steel by flame spraying and HVOF spraying techniques. A detailed microstructural investigation of flame sprayed layer shows the formation of γ-Ni and refined Ni<sub>3</sub>B precipitates. HVOF deposition led to development of Ni<sub>3</sub>B and Cr<sub>2</sub>B dispersion in partially amorphous γ-Ni matrix. Finally, the

hot corrosion behaviour of thermal spray deposited AISI 304 stainless steel with NiCrBSi has been undertaken in a 70%Na<sub>2</sub>SO<sub>4</sub>+30%NaCl molten salt media in the temperature ranges between 700 °C to 900 °C by cyclic test with total number of 18 cycles of heating and subsequent air cooling. Comparative studies between flame spraying and HVOF spraying show that HVOF spray deposition of NiCrBSi provides lower defect content, denser and better adherent coating than that of coating deposited by flame spraying. The appropriate reaction and mechanism of degradation of AISI 304 stainless steel and NiCrBSi coating in presence of salt mixture of Na<sub>2</sub>SO<sub>4</sub> and NaCl are established for the salt mixture of 70 wt% and 30 wt% composition, respectively.

## **Research Contribution from 2000 to 2011**

### **1. Laser Surface Engineering of Mg Alloys for Wear and Corrosion Resistance Application [71, 96, 114, 132, 147, 149, 150, 151, 153,155].**

Mg and its alloys have a potential scope of application in automotive industry. However, a relatively poor resistance to wear and corrosion are serious impediments against wider application of Mg and its alloys. A detailed investigation on improving the wear and corrosion resistance of magnesium alloy, MEZ (Zn 0.5%, Mn 0.1%, Zr 0.1%, rare earth elements 2 %, Mg rest) and AZ91 (Mg-9Al-0.9Zn) by laser surface engineering were undertaken to improve wear and pitting corrosion resistance properties. Laser surface remelting with a continuous wave CO<sub>2</sub> laser was found to improve the microhardness of the laser surface melted layer to 85-100 VHN as compared to 35 VHN of the as-received MEZ. For the first time it was established that laser surface melting significantly improves the pitting corrosion resistance of MEZ (corrosion rate reduces to 0.133 mpy for laser surface melted MEZ from 6.12 mpy of the as-received substrate in 3.56 wt.% NaCl solution) attributed to the combined influence of grain refinement, dissolution of intermetallic phases and retention of alloying elements (rare earth elements) in extended solid solution. Laser surface alloying with Al+Mn was found to improve the microhardness of the alloyed zone to as high as 250-350 VHN (as compared to 35 VHN of the substrate region) due to grain refinement and formation of intermetallics between Mg and Al (Mg<sub>17</sub>Al<sub>12</sub>)/Al and Mn (AlMn<sub>6</sub>). The corrosion rate in a 3.56 wt.% NaCl solution has significantly reduced to 4-6 times by laser surface alloying. A detailed study on the mechanism of corrosion showed that the enhanced corrosion resistance was attributed to the presence of Al<sub>2</sub>O<sub>3</sub> and Mn<sub>3</sub>O<sub>4</sub> oxide layer on the surface. Another major achievement in the present system is an improved wear resistance of MEZ by dispersion of SiC, Cr<sub>2</sub>C<sub>3</sub> and Al+Al<sub>2</sub>O<sub>3</sub> on the surface by laser surface melting and simultaneous deposition of carbide/oxide particles.

### **2. Prediction of Residual Stress in Laser Surface Engineering and Process Optimization to Minimize Residual Stress Distribution [148]**

Studies on the effect of laser surface melting and laser surface hardening on the residual stress developed in the laser treated region were undertaken and correlated with process parameters.

### **3. Process Optimization for Laser Assisted Bending of AISI 304 Stainless Steel [146]**

Process windows for laser assisted bending of AISI 304 stainless steel of two different thicknesses (0.9 mm and 1.6 mm) were proposed. Effect of laser parameters on the microstructures, phases and

mechanical properties of the bent zone and heat affected zone was evaluated. Laser bending led to refinement of microstructures and improvement in microhardness of the bent zone.

#### **4. Development of Compositionally Graded SiC Dispersed Composite Layer on Commercial Pure Aluminium [126,138,144].**

The present study concerns development of a hard SiC dispersed composite layer on Al substrate to improve its wear resistance property. A thin layer of SiC (dispersed in alcohol) is pre-deposited (thickness of 100  $\mu\text{m}$ ) on Al substrate and laser irradiated using a high power continuous wave (CW) CO<sub>2</sub> laser. The microstructure of the composite layer consists of dispersion of partially melted SiC particles in grain refined Al matrix. Part of the SiC particles was dissociated into silicon and carbon leading to formation of Al<sub>4</sub>C<sub>3</sub> phase and free Si redistributed in Al-matrix. Volume fraction of SiC is maximum at the surface and decreases with depth. The microhardness of the surface is improved by 2 to 3 times as compared to that of the as-received Al. A significant improvement in wear resistance in composite surfaced Al was observed as compared to the as-received Al. Pitting corrosion property (in a 3.56 wt.% NaCl solution) was marginally deteriorated.

#### **5. Studies on the Mechanism of Wear of in-situ TiB/TiB<sub>2</sub> Dispersed Al-matrix Composite [136].**

Attempts were made to develop a hard in-situ TiB<sub>2</sub>-dispersed Al-matrix composite layer on Al substrate with an objective to improve the wear resistance property. Laser composite surfacing was carried out by melting the surface of sand blasted commercially pure Al substrate using a continuous wave CO<sub>2</sub> laser and simultaneous deposition of a mixture of K<sub>2</sub>TiF<sub>6</sub> and KBF<sub>6</sub> (in the weight ratio of 2:1) using Ar as shrouding environment. Powder feed rate was maintained constant to 4 g/min. The microstructure of the composite layer consisted of uniformly dispersed TiB<sub>2</sub> particles in Al matrix. The microhardness of the surface was improved (to a maximum of 2 times) as compared to that of as-received Al substrate. There was a significant improvement in wear resistance in composite surfaced Al as compared to as-received one.

#### **6. Compositionally Graded SiC Dispersed Composite Surfacing on Mild steel by Two Steps Cladding [115]**

In the present study, an attempt has been made to develop a compositionally graded SiC dispersed phase on the surface of mild steel substrate by laser surface cladding technique. Compositionally graded layer was formed by two steps cladding with a bottom layer having 95 % Fe + 5 % SiC and a top layer of 85 % Fe + 15 % SiC, respectively using a continuous wave CO<sub>2</sub> laser, and simultaneous feeding of a mixture of Fe and SiC (in the said ratio) with Ar as shrouding atmosphere. The microstructure of the composite layer consisted of dispersion of SiC particles in iron matrix. In the upper layer, SiC was not dissociated, however, at the bottom layer there was a partial dissociation of the SiC particles. Volume fraction of particles was found to be maximum at the surface and decreased with depth. The microhardness of the surface was improved by 5 to 6 times as compared to that of the as-received mild steel substrate and decreased gradually with depth. A significant improvement in wear resistance in clad surface was observed. Finally, the corrosion resistance of laser clad surface showed an improvement as compared to the as-received substrate.

#### **7. Composite Surfacing of AISI 304 stainless steel by in-situ TiB/TiB<sub>2</sub> dispersion. [125].**

The present study concerns development of a hard in-situ boride-dispersed composite layer on the surface of AISI 304 stainless steel substrate to improve the wear resistance property. Laser processing was carried out by melting the surface of sand blasted AISI 304 stainless steel substrate using a continuous wave CO<sub>2</sub> laser and simultaneous deposition of a mixture of K<sub>2</sub>TiF<sub>6</sub> and KBF<sub>6</sub> (in the weight ratio of 2:1) using Ar as shrouding environment. Powder feed rate was maintained constant at 4 g/min. The microstructure of composite layer consisted of dispersion of titanium boride particles in AISI 304 stainless steel matrix. Volume fraction of particles is found to be uniform throughout the composite layer, though varied with laser parameters. The microhardness of the surface was improved 250 to 350 VHN as compared to 220 VHN of the AISI 304 stainless steel substrate with a significant improvement in wear resistance property. The mechanism of wear was found to be a combination of adhesive and abrasive in as-received stainless steel. However, it was predominantly abrasive for laser composite surfaced stainless steel.

#### **8. Direct laser cladding of AISI 316L stainless steel for bio-implant application [105, 107, 145].**

In the present study, laser assisted fabrication of AISI 316L stainless steel has been attempted using a high power (1.5 kW) continuous wave diode laser. The main process variables for the present study were applied power density, scan speed and powder feed rate. A detailed microstructural study of the surface and cross-section of the fabricated layer were carried out using optical and scanning electron microscopy to understand the influence of laser parameters on microstructure of the surface and interface between the successive layers. The microstructure of the top layer was equiaxed, the near substrate region was fine dendritic, however, at the interface between two successive layers, it was coarsened. The morphology and degree of fineness of the microstructure was found to vary with laser parameters. The range of grain size (maximum grain size–minimum grain size) was taken as a measure of homogeneity. It was found that with increasing the scan speed, the range of grain size was minimized. Micro-porosities were present in the microstructure that reduced with increasing scan speed and found to be minimum at a medium powder feed rate. The optimum processing conditions have been established by correlating the characteristics of the fabricated layer with process parameters. The mechanical property (microhardness) of the fabricated product has been evaluated using a microhardness testing machine and correlated with the process parameters. The electrochemical property, mainly pitting corrosion resistance of the fabricated layer corresponding to maximum microhardness (in a 3.56% NaCl solution) has been evaluated using standard potentiodynamic polarization testing. The microhardness of the laser assisted fabricated layers was found to vary from 170 to 278 VHN, increased with decrease in applied power density and increase in scan speed and was higher than that of conventionally processed 316L (155 VHN). The superior microhardness value is attributed to grain refinement associated with laser melting and rapid solidification. The critical potential to pit formation (EPP1) was measured to be 550 mV saturated calomel electrode (SCE) and superior to the conventionally processed 316L stainless steel (445 mV (SCE)).

#### **9. Direct laser cladding of compositionally graded Ti-6Al-4V and Co layers for femoral joint [90,106].**

In the present study, attempts have been made to fabricate a Co layer on the surface of Ti-6Al-4V substrate by laser assisted fabrication technique with an objective to develop compositionally graded hip and femoral prostheses. Laser processing was carried out by melting of Co powder (of 25 μm particle size) with a continuous wave CO<sub>2</sub> laser and depositing it on Ti-6Al-4V substrate in a layer by layer fashion using Ar as shrouding

environment to avoid oxidation. The process variables were applied power density, scan speed and number of layers. During the development of 1st layer, laser power and scan speeds were varied to develop a compositionally graded interface, following which the successive layers were formed. A detailed microstructural study of the fabricated layers was carried out to understand the influence of laser parameters on microstructure. X-ray diffraction study and energy dispersive spectroscopic analysis were undertaken to see if non-equilibrium cooling associated with the process has caused formation of any new phase or segregation of elements in the microstructure. Following characterization, the mechanical property (wear resistance) and electrochemical property of the fabricated components have been evaluated.

## **Research Contribution up to 2000**

### **1. Enhancing Pitting Corrosion Resistance of AISI 304 Stainless Steel [163,168]**

AISI 304 stainless steel, despite its otherwise good aqueous corrosion resistance, is prone to severe pitting corrosion in the presence of halide ions. Usually, 3-4 wt.% Mo is added to the bulk to overcome this limitation (AISI 316/316L). Instead of bulk alloying, it has been demonstrated that the pitting corrosion resistance of AISI 304-stainless steel could be significantly enhanced to a level better than that of AISI 316 stainless steel by laser surface alloying with Mo. Most importantly, an optimum processing zone for laser surface alloying has been established following a detailed correlation between the laser parameters and properties of the alloyed zone.

### **2. Enhancing Wear Resistance of Copper [162, 169].**

Copper is a well-known conductor of heat and electricity. However, a poor hardness of copper often leads to wear and short-circuiting. Bulk alloying with Zn, Sn, etc. may improve the mechanical properties but deteriorates electrical conductivity. Laser surface alloying has been successfully attempted to enhance the hardness and wear resistance of copper without affecting its electrical conductivity. The extension of solid solubility achieved by laser surface alloyed far exceeded that obtained by the other rapid quenching methods. A process optimization map has been developed following a detailed correlation of the mechanical properties with laser parameters, and in turn, with the microstructure and composition of the alloyed zone.

### **3. Enhancing Oxidation and Wear Resistance of Titanium [52,157,158,159,162,164].**

Ti and its alloys possess high specific strength, high melting temperature and good corrosion properties. However, the high temperature oxidation resistance of Ti is poor especially, beyond 450 °C which restricts the application of Ti based compressor blades up to 550°C. Dr. Dutta Majumdar has been able to enhance the high temperature oxidation resistance of Ti by LSA with Si, Al and Si+Al up to 800°C. Following LSA, she has successfully characterized the metastable microstructure and composition of the alloyed zone and correlated them with the oxidation and wear properties. It has been demonstrated that high volume fraction of Ti<sub>5</sub>Si<sub>3</sub> phase was mainly responsible for improving oxidation (by providing a barrier to counter ionic mass transport) and wear (by reducing the friction coefficient) resistance of Ti. The improvements achieved have been superior to the earlier efforts based on surface alloying with Al alone. In fact, Dr. Dutta Majumdar has proved for the first time that silicides could be more useful in enhancing oxidation and wear properties of Ti than that by aluminides (as commonly believed). She has proposed a detailed model

that explains the mechanism of oxidation protection and wear reduction of Ti by LSA with Si and/or Si+Al.

#### 4. Mathematical Modeling of Laser Surface Engineering [156]

The knowledge of temperature is essential to predict the composition and microstructure, and hence, the properties developed by LSA. However, experimental determination of the temperature profile within the very short interaction time of laser irradiation during LSA is practically impossible. Dr. Dutta Majumdar has developed a mathematical model (both one and two dimensional) using explicit finite difference technique that is capable of predicting the temperature profile, heating/cooling rate, solidification velocity and the morphology of the microstructure of the alloyed zone. This effort, though based on simplified assumptions, constitutes the first numerical approach to model LSA (melting/solidification of bi-metallic layers) reported in the literature.

## Laboratories Developed

### 1. Development of Electron Beam Welding Facility



**The State of the art electron beam welding (12 kW, 80 kV, indigenously developed by BARC, Bombay) facility was developed under the Board of Research in Nuclear Science sponsored project (acted as Co-PI, PI: Prof. G. L. Dutta, Prof. I. Manna and Prof. G. G. Roy) in**

collaboration with BARC Bombay. The equipment is installed in the Steel Technology Centre, IIT Kharagpur.

## 2. Development of Thermal Spraying Facility

Thermal spray deposition is the versatile technique, which may be applied for the deposition of metallic, ceramic and also polymeric materials. However, a proper choice of spray torch is essential. With the aim to develop thermal spray deposition laboratory, a high velocity oxyfuel set up (for the development of metallic coating) and plasma spraying unit (for the development of metallic and ceramic coating) have been developed and installed. Funding from Naval Research Board and Department of Science and Technology are thankfully acknowledged. These facilities are installed in the Thermal Spraying Laboratory next to Steel Technology Center.



**Sand Blasting Unit developed under the project sponsored by Department of Science and Technology, N. Delhi and installed in the thermal spraying laboratory**



**High velocity oxyfuel coating unit (Model No.: Hypojet – 2700, Made: MEC, Jodhpur) developed under the project (as a PI) sponsored by Naval Research Board and installed in the thermal spraying laboratory.**



**Plasma Spray Deposition unit (Model No.: SG 100 Miller thermal Inc., USA) developed under the project sponsored by Department of Science and Technology, N. Delhi (as a PI) and installed in the thermal spraying laboratory.**

### **Wear Testing Unit**

**A number of wear testing units have been developed and installed in the Tribology Laboratory of the Department of Metallurgical**



**Ball-on Disc and Fretting Wear testing units (developed by Ducom) have been developed under the project sponsored by CSIR (as a PI) and installed in the wear testing laboratory of the Department.**

### **Laser Materials Processing Facility**



**Laser materials processing (6 kW, GaAs Laser) facility has been developed under the project (as a Co-PI, PI: Prof. I. Manna) sponsored by Department of Science and Technology, N. Delhi and installed in the Steel Technology Center.**

## **AUTHOR EVALUATION REPORT (Source: Google Scholar)**

<u>Citations</u>	8918
<u>h-index</u>	47
<u>i10-index</u>	144

### **16. Publications of Prof. Dutta Majumdar J.**

#### Research Publications

##### Dissertations

1. Some Studies on Laser Surface Alloying of Copper with Chromium and AISI 304 Stainless Steel with Molybdenum  
*Doctoral (Ph.D.) Thesis* (1999), I.I.T., Kharagpur  
Supervisors: Prof. I. Manna (I. I. T. Kharagpur) and Prof. B. L. Mordike (T. U. Clausthal, Germany)
2. Laser Surface Alloying of Titanium with Silicon, Aluminium and Silicon + Aluminium to Enhance Oxidation and Wear Resistance  
Dr.-Ing. Dissertation, TU Clausthal, Germany, Yr.: 2000, ISBN No.: 3-89720-385-5  
Supervisors: Prof. B. L. Mordike (T. U. Clausthal, Germany) and Prof. I. Manna (I. I. T. Kharagpur)

##### In Refereed Journals

List of publications:

1. Anishetty, S., Bera, T., Majumdar, J. D., & Manna, I. (2025). Evaluation of Microstructure and Mechanical and Corrosion Properties of IN718 Superalloy Components Fabricated by Laser Direct Energy Deposition. *Journal of Alloys and Compounds*, 183236.

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1. P. Sharma, I. Manna, S. C. Sharma and A. K. Jha, **J. Dutta Majumdar** (2016) **“Development of La<sub>2</sub>O<sub>3</sub> - YSZ Composite Thermal Barrier Coating by Plasma Spray Deposition”**. **Proceedings of the CORCON-2016, organized by the National Association of Corrosion Engineers, held in N. Delhi, during 19<sup>th</sup> to 21<sup>st</sup> September, 2016.**

2. **J. Dutta Majumdar**, R. Kumari, H. Besser, T. Scharnweber and W. Pflöging. Studies on Laser Surface Texturing of Titanium Alloy', Proceedings in the Lasers in Manufacturing (LIM), 2015 held in International Congress Center Munich, Germany during 25<sup>th</sup> to 29<sup>th</sup> June, 2015.
3. International Conference of Sustainable Materials Science and Technology, held in Saint Denis, Paris during 15<sup>th</sup> to 17<sup>th</sup> July, 2015 and delivered the following oral talks:  
Studies on Electron Beam Welding of Cr-Mn Stainless Steel  
Studies on Characteristics of Titanium Cenosphere Composites Developed by Powder Metallurgy Route.
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*Papers Presented in Conferences (Abstract printed)*

1. J. Dutta Majumdar, A. S. Dash, Deepa Devapal, S. C. Sharma, and I. Manna, Development of Nanostructured CoNiCrAlY based Bond Coat by HVOF Spraying for Thermal Barrier Coating Application, presented as an invited article in the Asian Thermal Spray Conference held in IIT Madras during 2<sup>nd</sup> November to 4<sup>th</sup> November, 2023.
2. **Dileep Madapana**, Ravi Bathe, Indranil Manna, and Jyotsna Dutta Majumdar "Tribocorrosion behavior of Ultrafast Laser processed Titanium Alloy (Ti-6Al-4V)" presented in NMD ATM 2021 (Online) (Oral Presentation) during 13th to 15th of November 2021.
3. **Dileep Madapana**, Ravi Bathe, Indranil Manna, Pratim Das, and Jyotsna Dutta Majumdar "Corrosion Behavior of Ultrafast Laser Surface Processed Ti alloy (Ti-6Al-4V) in Simulated Body Fluid", presented in MCI-2022 (Online) (Oral Presentation) during 23<sup>rd</sup> to 24<sup>th</sup> June 2022.
4. **Dileep Madapana**, Harikrishnan Ramadas, Ashish Kumar Nath, Jyotsna Dutta Majumdar "Mechanical and Electrochemical Behavior of Laser Shock Peened Ti6AL4V", presented in LAMP-2022 (Online) (Oral Presentation) during 29<sup>th</sup> to 31<sup>st</sup> August 2022.
5. **Dileep Madapana**, Harikrishnan Ramadas, Ashish Kumar Nath, Jyotsna Dutta Majumdar "Studies on Laser Shock Peening on Nanomechanical and Mechanochemical Properties of Titanium Alloy (Ti6Al4V)" presented in NMD ATM 2022, held in Hyderabad, India (Poster Presentation).
6. **Madapana Dileep**, Jyotsna Dutta Majumdar "Electrochemical behavior of Laser Shock Peening (LSP) of Titanium alloy (Ti6Al4V) in Simulated Body Fluid" presented in ICPCM-2022, held in Raurkela, India (Oral Presentation) during 9<sup>th</sup> to 11<sup>th</sup> December 2022.
7. **Madapana Dileep**, Jyotsna Dutta Majumdar "Studied on Laser Shock Peening (LSP) of Titanium alloy (Ti6Al4V)" presented in Research Scholars Day 2023, held in MMED, IIT KGP, India (Oral Presentation) on 15<sup>th</sup> April 2023.
8. **Dileep Madapana**, Ravi Bathe, Indranil Manna, and Jyotsna Dutta Majumdar "Corrosion, Tribocorrosion and Bioactivity of Ultrafast Laser Structured Titanium alloy (Ti6Al4V)" presented in EMRS Spring Meeting 2023, held in Strasbourg, France (Oral Presentation) during 29<sup>th</sup> May to 2<sup>nd</sup> June 2023.
9. **Bipasha Das**, "Development of in situ Carbide Dispersed Titanium Matrix Composite on Ti6Al4V by laser reactive melting" presented at the International Conference on "Laser-Assisted Material Processing" (LAMP 2022) on 29-31 August 2022.
10. **Bipasha Das**, "Development of TiC dispersed Ti6Al4V matrix composite coating by laser surface alloying" presented at the International Conclave on Materials, Energy & Climate held on 18–21 December 2023.
11. **Shree Krishna**, D Chakraborty, I Manna and Jyotsna Dutta Majumdar, "Studies on Laser surface cladding of Multicomponent alloy on Titanium" presented in the International Conference on "Laser Assisted Material Processing" (LAMP-2022) on 29-31 August 2022
12. **Shree Krishna**, Indranil Manna, and Jyotsna Dutta Majumdar "Studies on Wear behavior of High entropy alloy developed by mechanical alloying and spark plasma sintering" presented

in the International Conclave on Materials, Energy & Climate held in Delhi during December 18th to 21st 2023.

2. **J. Dutta Majumdar and Carsten Blawert, “Plasma Electrolytic Oxidation of Magnesium”** presented in the International Conference on Frontiers in Materials Processing Applications, Research and Technology, held in Ahmedabad during December 15th to 18th, 2019.
2. **J. Dutta Majumdar, S. Nath, S. C. Sharma, I. Manna, “Development and Performance Evaluation of Compositionally Graded Ytria Stabilized Zirconia based Thermal Barrier Coating”**, delivered (**keynote talk**) in the 26<sup>th</sup> International Conference and Expo on Corrosion held in CIDCO Exhibition Center, Vashi, Navi Mumbai during 23<sup>rd</sup> to 26<sup>th</sup> September, 2019.
3. **M. Kumar, J. Dutta Majumdar and I. Manna, Laser Assisted 3-D manufacturing of Materials (Invited Talk), presented in the** International Symposium on Metastable, Amorphous and Nanostructured Materials (ISMANAM), in Indian Institute of Technology Madras, during 8-10<sup>th</sup> July, 2019.
4. **Jyotsna Dutta Majumdar, Micro-Nano-structured Surface by Ultra-fast Laser Processing , presented (oral) in the 2019 Spring Meeting of the European Materials Research Society (E-MRS) held from May 27 to 31, 2019, in Nice, France**
5. **Jyotsna Dutta Majumdar, Silja Katharina Rittinghaus, Konrad Wissenbach, Daniel Höche, Carsten Blawert, and Andreas Weisheit, Microstructural Evolution and Microhardness of Direct Laser Clad TiC Dispersed Titanium Aluminide (Ti45Al5Nb0.5Si) Alloy, 2<sup>nd</sup> International Conference in Sustainability in Materials and Manufacturing Processes (SMPM)-held in SUN CITY RESORT, SOUTH AFRICA, during 8<sup>th</sup> to 10<sup>th</sup> March, 2019.**
6. **J. Dutta Majumdar “Development of Hydroxyapatite (HA) based Composite Coating on Titanium Alloy (Ti-6Al-4V) Substrate by Plasma Spray Deposition and Post Spray Heat Treatment” delivered (Invited talk) in the *International Conference on PROCESSING & MANUFACTURING OF ADVANCED MATERIALS Processing, Fabrication, Properties, Applications, held in Paris, France during July 8th to 13th, 2018 (Invited Talk).***
7. **Jyotsna Dutta Majumdar, Electron Beam Assisted Surface Engineering of Metals and Alloys, delivered (Invited talk) in the 13 THIRTEENTH INTERNATIONAL CONFERENCE ON ELECTRON BEAM TECHNOLOGIES during 18– 22 June 2018 Varna,**
8. **Jyotsna Dutta Majumdar, Laser Composite Surfacing for Improved Wear Resistance, delivered (Lead talk) in the International Conference on Sustainable Materials Processing and Manufacturing, SMPM 2017, during 23-25 January 2017, in Kruger National Park, South Africa (keynote talk)..**
9. **Jyotsna Dutta Majumdar, Women in Science and technology, the Status and Challenges Ahead, delivered (Invited talk) in the Annual Women’s Meet, on 4<sup>th</sup> March, 2017 organized by Venus International Foundation.**
10. **Jyotsna Dutta Majumdar, Stainless Steel Based Implants-Present Status and Scope of Improvement, delivered (Invited talk) on 15<sup>th</sup> March, 2017 in the International Conference on Biomaterials, held in IESR Shibpur.**
11. **Jyotsna Dutta Majumdar, Subhasisa Nath, A.K. Jha, S.C. Sharma, Indranil Manna, Nano-mechanical Property and Wear Behavior of Ytria Stabilized Zirconia Based Thermal Barrier Coatings Developed by Plasma Spraying, delivered (Invited talk) in**

- the Conference on Advanced Materials, during 14<sup>th</sup> to 17<sup>th</sup> March, in VSSC Trivandrum.
12. **J. Dutta Majumdar, Ultra-fast Laser Assisted Surface Processing of Metallic Materials**, delivered (**Invited talk**) in the conference on “**Advances in Functional and Structural Materials**” held in AMPRI, Bhopal during 13<sup>th</sup> to 17<sup>th</sup> January, 2017.
  13. J. Dutta Majumdar, **Studies on Laser Shock Peened Medium carbon (0.4% C) Steel using Femto-second Laser**, presented in the Spring Meeting of the European Materials Research Society (E-MRS) held from May 22 to 26, 2017, in Strausbourg, France.
  14. **J. Dutta Majumdar, Tailoring the Performance of Metallic Bio-implant by Surface Engineering**, presented in the East Asia & Pacific Area Conference & Expo from 17<sup>th</sup> September to 20<sup>th</sup> September 2017 in Mumbai (**Invited Talk**).
  15. **J. Dutta Majumdar “Wear Behavior of Hydroxyapatite based Composite Coating on Ti-6Al-4V for Bio-implant Application”**, delivered as an invited talk in the 70<sup>th</sup> Annual Technical Meeting (*ATM*) of the Indian Institute of Metals organized in Indian Institute of Technology Kanpur during November 11<sup>th</sup> to 13<sup>th</sup>, 2016.
  16. **J. Dutta Majumdar “Surface Designing of Titanium for Bio-implant Application”**, delivered as the keynote talk in the 4<sup>th</sup> International Conference on Advances in Materials and Materials Processing organized at Indian Institute of Technology Kharagpur during 5<sup>th</sup> to 7<sup>th</sup> November, 2016.
  17. P. Sharma, I. Manna, S. C. Sharma and A. K. Jha, **J. Dutta Majumdar (2016) “Development of La<sub>2</sub>O<sub>3</sub> - YSZ Composite Thermal Barrier Coating by Plasma Spray Deposition. Proceedings of the CORCON-2016, organized by the National Association of Corrosion Engineers, held in N. Delhi, during 19<sup>th</sup> to 21<sup>st</sup> September, 2016.**
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  19. J. Dutta Majumdar, Studies on Electron Beam Welding of Cr-Mn Stainless Steel, delivered (**Invited talk**) in the International Conference of Sustainable Materials Science and Technology, held in Saint Denis, Paris during 15<sup>th</sup> to 17<sup>th</sup> July, 2015.
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  21. J. Dutta Majumdar J (2012), Near Net Shaping of Component by Direct Laser Cladding, presented in the **3<sup>rd</sup> Asian Symposium on Materials and Processing held in I. I. T. Madras during 30-31<sup>st</sup> August, 2012.**
  22. Gururaj T, Dutta Majumdar J, Manish Tak, G. Padmanabham, Manna. I (2012), Effect of Heat Treatment On Microstructure And Properties Of Laser Cladded H13 Tool Steel Layer On H13 Tool Steel presented in the **3<sup>rd</sup> Asian Symposium on Materials and Processing held in I. I. T. Madras during 30-31<sup>st</sup> August, 2012.**
  23. Dutta Majumdar J and Sharma P (2012), Nano-Boride Dispersed Coating on AISI 304 Stainless Steel by HVOF Spraying and Laser Melting, presented in the 26<sup>th</sup> International Conference on Surface Modification Technology held in Ecully, Lyon, France during June 20<sup>th</sup> to 22<sup>nd</sup>, 2012 (**Invited Tak**).
  24. **Dutta Majumdar J. (2012)**, Surface Physics and Surface Engineering of Ti-6Al-4V for Orthopedic Application, delivered (**Invited talk**) at the International Conference on “**Women in Science and Technology- Local and Global Perspective**” held in Dhaka, Bangladesh during February 2-4, 2012.

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26. Nath Subhasisa, Pityana S and **Dutta Majumdar J. (2011)**, Improved Wear Resistance of Commercially Pure Aluminium by Laser Surface Alloying with 70WC-15Co-15NiCr. presented at the International Conference in Advanced Materials and Materials Processing held at Indian Institute of Technology Kharagpur during December 9-11, 2011/
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31. **Dutta Majumdar J** (2011), **Structure-Property-Correlation in Laser Surface Alloyed AISI 304 Stainless Steel with WC+Ni+NiCr**, presented at the , Presented at the at the 66 th Annual Technical Meeting of the Indian Institute of Metals, held in Hyderabad, India, November 2011.
32. Kumar A., Berger H. and **Dutta Majumdar J. (2011)**, **Surface Characterization and Wear Behavior of Laser Surface cladding of Ti-6Al-4V on AISI316L Stainless Steel presented at the** , Presented at the at the 66 th Annual Technical Meeting of the Indian Institute of Metals, held in Hyderabad, India, November 2011.
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34. **Nath S, Manna I., and Dutta Majumdar J. (2011) High temperature Oxidation Resistance of Functionally Graded Thermal Barrier Coating**, Presented at the at the 66 th Annual Technical Meeting of the Indian Institute of Metals, held in Hyderabad, India, November 2011.
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38. **Dutta majumdar J.** (2010): "Laser Assisted Composite Surfacing of Materials" delivered (**Invited talk**) at the International Conference on "Laser and Plasma Applications in Materials Science- 2010" held in Algiers, Algeria during November 27<sup>th</sup> to 30<sup>th</sup>, 2010.
39. **Dutta Majumdar J.** (2010): "Laser Composite Surfacing for Improved Wear Resistance" delivered (**Invited talk**) at the International Conference on "Laser Assisted Net Shape Engineering- 2010" held in Erlangen, Germany during Sept. 22<sup>nd</sup> to 24<sup>th</sup>, 2010.
40. **Dutta Majumdar J.** (2010): "Laser – A Clean Source of Energy for Materials Processing" at the 4<sup>th</sup> International Convention and General Assembly of Third World Academy of Women in Science held in Beijing, China during June 28<sup>th</sup> to July 1<sup>st</sup>, 2010.
41. **Dutta Majumdar J.** (2010): Surface Engineering for Improving Corrosion Resistance of Marine Structures, at the International Workshop on Application of Coating in Marine Components' held in Pune during February 5-6, 2010.
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54. **Dutta Majumdar, J. (2008): Laser Materials Processing Activities in India delivered** at the Workshop on ‘Areas of Common Interest between EU and Developing Countries in the field of Laser Technology’ held in Cairo, Egypt.
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60. **Dutta Majumdar, J.,** Ramesh Chandra, B. and Manna, I. (2005): Laser Composite Surfacing of AISI 304 Stainless Steel with Titanium Boride for Improved Wear Resistance Presented at the 60th Annual Technical Meeting of the Indian Institute of Metals, held in Jamshedpur, India, November 2005.
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62. **Dutta Majumdar, J.**, Ramesh Chandra, B., Nath, A.K. and Manna, I. (2006): Laser Composite Surfacing of Copper with TiB<sub>2</sub> for Tribological Application. Presented at the International Conference on Advanced Materials and Materials Processing (ICAMMP-06), held at Indian Institute of Technology, Kharagpur, India, February 2006.
63. **Dutta Majumdar, J.**, Ramesh Chandra, B., Nath, A.K. and Manna, I. (2006): Studies on Laser Surface Annealing of Copper . Presented at the International Conference on Advanced Materials and Materials Processing (ICAMMP-06), held at Indian Institute of Technology, Kharagpur, India, February 2006.
64. **Dutta Majumdar, J.**, Ramesh Chandra, B. and Manna, I. (2005): Laser Assisted Composite Surfacing for Tribological Application. Presented at the International Conference on Advanced materials and Materials Design held in Panaji, Goa, India, December 2005.
65. Ramesh Chandra, B., **Dutta Majumdar, J.** and Manna, I. (2005): Laser Composite Surfacing of AISI 304 Stainless Steel. Presented at the International Conference on Advanced materials and Materials Design held in Panaji, Goa, India, December 2005.
66. Biswas, A., Chatterjee, U.K. and **Dutta Majumdar, J.** (2005): Studies on Laser Surface Nitriding of Ti-6Al-4V for Bioimplant Application. Presented at the International Conference on Advanced materials and Materials Design held in Panaji, Goa, India, December 2005.
67. **Dutta Majumdar, J.** (2005): Studies on Kinetics and Mechanism of Corrosion of Laser Assisted Fabricated AISI 316L Stainless Steel. Presented at the International Conference on national Association of Corrosion Engineers (NACE-06) held in Madras, India, November 2005.
68. **Dutta Majumdar, J.**, Ramesh Chandra, B., Nath, A.K. and Manna, I. (2005): Laser composite surfacing of stainless steel with SiC and TiB<sub>2</sub> Presented at the 59th Annual Technical Meeting of the Indian Institute of Metals, held in Madras, India, November 2005.
69. Biswas, A., Chatterjee, U.K., Manna, I., Maity, T.K. and **Dutta Majumdar, J.** (2005): Studies on Laser Surface Nitriding of Ti-6Al-4V for Bioimplant Application. Presented at the 59th Annual Technical Meeting of the Indian Institute of Metals, held in Madras, India, November 2005.
70. Basu, A., **Dutta Majumdar, J.**, Mukherjee, S. and Manna, I. (2005): Studies on Plasma Nitriding of 52100 Steel. Presented at the 59th Annual Technical Meeting of the Indian Institute of Metals, held in Madras, India, November 2005.
71. **Dutta Majumdar, J.**, Ramesh Chandra, B., Nath, A.K. and Manna, I. (2005): Laser composite surfacing of stainless steel with SiC. Presented at the EMRS fall meeting held in Warsaw, Poland, September 2005.
72. **Dutta Majumdar, J.**, Ganesan, S.M., Manna, I. and Nath, A.K. (2005): Laser Assisted fabrication of Co on Ti for bioimplant application. Presented at the EMRS fall meeting held in Warsaw, Poland, September 2005.
73. J. Dutta Majumdar, Ramesh Chandra, B., Nath, A.K. and Manna, I. (2004): Laser Composite Surfacing of Aluminium. In the proceedings of International Symposium on Advanced Materials and Processing (ISAMAP2K4) (ed.: Banthia, A. K.) held at Indian Institute of Technology, Kharagpur, India, December.
74. Dutta Majumdar, J., Ganeshan, S.M., Manna, I. and Li, L. (2004): Direct Laser Deposition of 316L Stainless Steel. In the proceedings of International Symposium on Advanced Materials and Processing (ISAMAP2K4) (ed.: Banthia, A. K.) held at Indian Institute of Technology, Kharagpur, India, December 2004.
75. **Dutta Majumdar, J.**, Ramesh Chandra, B., Nath, A.K., Kaul, R. and Manna, I. (2004): Studies on Wear and Erosion Properties in Laser Composite Surfaced Aluminium with

- Silicon Carbide and Alumina. Presented at the 58th Annual Technical Meeting of the Indian Institute of Metals, held in Trivandrum, India, November 2004.
76. **Dutta Majumdar, J.**, Ganeshan, S.M., Manna, I. and Li, L. (2004): Studies on Laser Assisted Fabrication of AISI 316L Stainless Steel . Presented at the 58th Annual Technical Meeting of the Indian Institute of Metals, held in Trivandrum, India, November 2004.
  77. J. Dutta Majumdar, Ramesh Chandra, B., Nath, A.K. and Manna, I. (2004): Laser Surface Melting and Composite Surfacing of Aluminium with Silicon Carbide. In the International Convention on Surface Engineering (INCOSURF – 04) held in Bangalore, India, August 2004.
  78. Rao, K.R., Basu, A., Chattoraj, I., Mallik, A., Mukherjee, S., Roy, S.K., **Dutta Majumdar, J.**, and Manna, I. (2004): Plasma Immersion Ion Implantation of AISI 52100 Ball Bearing Steel for the Enhancement of Hardness and Corrosion Resistance. At the International Convention on Surface Engineering (INCOSURF – 04) held in Bangalore, India, August 2004.
  79. **Dutta Majumdar, J.**, Pinkerton, A., Liu, Z., Manna I. and Li L. (2004): Microstructure Characterisation and Process Optimization of Laser Assisted Rapid Fabrication of 316L Stainless Steel. At the Spring meeting of European materials Research Society, held in Strausssbourg, France, May 2004.
  80. **Dutta Majumdar, J.**, Pinkerton, A., Liu, Z., Manna, I. and Li, L. (2004): Mechanical and Electrochemical Properties of Multiple-Layer Diode Laser Cladding of 316L Stainless Steel. At the Spring meeting of European materials Research Society, held in Strausssbourg, France, May 2004.
  81. **Dutta Majumdar, J.**, Nath A.K. and Manna, I. (2004): Studies on Laser Bending of AISI 304 Stainless Steel. At the Spring meeting of European materials Research Society, held in Strausssbourg, France, May 2004.
  82. **Dutta Majumdar, J.**, Nath, A.K. and Manna, I. (2004): Laser Surface Hardening of 0.6% Carbon Steel - Process Optimization. At the Workshop on Applications of Laser in Mechanical Industry (Eds.: Choudhury, S. P. and Chaudhuri, B.) held in Jadavpur University, Calcutta, India, February 2004.
  83. **Dutta Majumdar, J.**, (2003): Laser Surface Engineering of Magnesium. At the National Laser Symposium held at the Indian Institute of Technology, Kharagpur, India, December 2003.
  84. **Dutta Majumdar, J.**, Galun, R., Mordike, B.L. and Manna, I. (2003): Studies on laser surface alloying of a Mg alloy with nickel. In the proceedings of International Conference on Advances in Surface Treatment: Research and Applications (ASTRA-04) held in Hyderabad, India, November 2003.
  85. **Dutta Majumdar, J.**, and Manna, I. (2003): Laser surface alloying of Nimonic with Si+Al to enhance oxidation resistance. In the proceedings of International Conference on Advances in Surface Treatment: Research and Applications (ASTRA-03) held in Hyderabad, India, November 2003.
  86. **Dutta Majumdar, J.**, Mordike, B.L. and Manna, I. (2004): Laser Assisted Compositionally Graded Coating on a Mg Alloy. National Conference on Corrosion Engineering, held in Bombay, India, December 2004.
  87. **Dutta Majumdar, J.**, Nath A.K. and Manna, I. (2003): Studies on Laser Surface Melting of Steel. Presented at the 57th Annual Technical Meeting of the Indian Institute of Metals, held in Kolkata, India, November 2003.
  88. Manna, I., Galun, R., Mordike, B.L. and **Dutta Majumdar, J.**, (2003): Laser Surface Engineering of Magnesium. Presented at the 57th Annual Technical Meeting of the Indian Institute of Metals, held in Kolkata, India, November 2003.

89. **Dutta Majumdar, J.**, and Manna, I. (2003): Thermal Spray Deposition. In the Proceedings of “Conference on Advances in Welding Technology (WELD TECH-2003)” (ed.: Dutta, G.L.) held in I. I. T., Kharagpur, India, March 2003.
90. **Dutta Majumdar, J.**, Ravi Kumar, B., Nath, A.K. and Manna, I. (2002): Residual stress Developed in Laser Surface Hardened 0.6% C Steel. Presented at the 56th Annual Technical Meeting of the Indian Institute of Metals, held in Vadodara, India, November 2002.
91. **Dutta Majumdar, J.**, Galun, R., Mordike, B.L. and Manna, I. (2002): Improving Wear and Corrosion Resistance of a Magnesium Alloy by Laser Surface Engineering for Automotive Application. Presented at the International Conference on Metals and Materials for Automobile Industry (ICMMAI-2002), held in Pragati Maidan, New Delhi, India, September 2002.
92. **Dutta Majumdar, J.**, Galun, R., Mordike, B.L. and Manna, I. (2002): Laser composite surfacing of a magnesium alloy to improve wear resistance. Presented at the International Conference on Advanced materials and Materials Processing (ICAMMP-2002), held in I.I.T., Kharagpur, India, February 2002.
93. **Dutta Majumdar, J.**, Galun, R., Mordike, B.L. and Manna, I. (2002): Laser Surface Cladding of Magnesium for Improved Wear and Corrosion Resistance. Presented at the International Conference on Advanced materials and Materials Processing (ICAMMP-2002), held in I.I.T., Kharagpur, India, February 2002.
94. **Dutta Majumdar, J.**, Mordike, B.L., Roy, S.K. and Manna, I. (2000): Laser Surface Alloying of Mg Alloy to Improve Corrosion Resistance. Presented at the 55th Annual Technical Meeting of the Indian Institute of Metals held in Bhubaneswar, India, November 2000.
95. **Dutta Majumdar, J.**, Mordike, B.L. and Manna, I. (2000): Aging Behavior of Laser Surface Alloyed Titanium with Silicon. Presented at the 55th Annual Technical Meeting of the Indian Institute of Metals held in Bhubaneswar, India, November 2000.
96. **Dutta Majumdar, J.**, Mordike, B.L., Roy, S.K. and Manna, I. (2001): Enhanced Oxidation Resistance of Ti by Laser Surface Alloying with Si, Al and Si+Al, Presented in the “International Conference on Advances in Surface Science and Engineering (INSURE–2001)”, held in Madras, India, February 2001.
97. **Dutta Majumdar, J.**, Mordike B.L. and Manna, I. (2000): Laser Surface Alloying - an Advanced Surface modification Technology. Presented in the “Shaping the Future - Global Dialogue III (Science and Technology-Thinking the Future)” forum held in Hannover, Germany, July 2000.
98. Manna, I. Rao, K., Dayal, R.K., **Dutta Majumdar, J.**, and Roy, S.K. (2000): Laser Surface Alloying of Ferritic Steel to Enhance Oxidation Resistance. Presented at the 87th Indian Science Congress, held in Pune, India, January 2000.
99. Manna, I., **Dutta Majumdar, J.** and Mordike, B.L. (2000): Friction and Wear Behavior of Ti following Laser Surface Alloying with Si, Al and Si+Al. Presented at the 87th Indian Science Congress, held in Pune, India, January 2000.
100. **Dutta Majumdar, J.** (2000): Application of Laser Surface Engineering to Improve Surface Dependent Engineering Properties (Young Scientist Presentation). Presented at the 87th Indian Science Congress, held in Pune, India, January 2000.
101. **Dutta Majumdar, J.** (1996): Laser Surface Alloying (Young Metallurgist Presentation). Presented at the 54th Annual Technical Meeting of the Indian Institute of Metals held in Vilai, India, November 1999.

102. **Dutta Majumdar, J.** (1999): Doctoral thesis entitled "Some Studies of Laser Surface Alloying of 304-Stainless Steel with Molybdenum and Copper with Chromium". Presented at the National Laser Symposium held in Hyderabad, India, December 1999.
103. Manna, I. and **Dutta Majumdar, J.** (1998): Metastable Microstructure Developed by Laser Surface Alloying of Copper with Chromium. Presented at the 53rd Annual Technical Meeting of the Indian Institute of Metals held in Kanpur, India, November 1998.
104. **Dutta Majumdar, J.,** Weisheit, A., Mordike, B.L. and Manna, I. (1998): Improvement in Isothermal Oxidation Resistance of Ti by Laser Surface Alloying with Si and Si+Al. Presented at the 52nd Annual Technical Meeting of the Indian Institute of Metals held in Bangalore, India, November 1998.
105. **Dutta Majumdar, J.,** Mordike, B.L. and Manna, I. (1998): Laser Surface Alloying of Ti with Si, Al and Si+Al for improved oxidation resistance. Presented at the annual meeting of Indian Science Congress Association held in Hyderabad, India, January 1998.
106. **Dutta Majumdar, J.,** Mordike, B.L. and Manna, I. (1997): Laser Surface Alloying of Ti with Si, Al and Si+Al for improved oxidation resistance. Presented at the Workshop on Application of Lasers in Mechanical Industry held in Calcutta, India, December, 1997.
107. **Dutta Majumdar, J.,** Weisheit, A., Mordike, B.L. and Manna, I. (1997): Laser Surface Alloying of Ti with Si, Al and Si+Al for improved oxidation resistance. Presented at the 51st Annual Technical Meeting of the Indian Institute of Metals held in Jamshedpur, India, November 1997.
108. **Dutta Majumdar, J.,** U.K. Chatterjee, U.K., Nath, A.K. and Manna, I. (1996): Improvement in Wear and Erosion Resistance of Copper by Laser Surface Alloying. Presented at the Discussion Meeting on Surface Science and Engineering (SURE 96), held at the I.G.C.A.R., Kalpakkam, India, January 1996.
109. **Dutta Majumdar, J.,** U.K. Chatterjee, U.K., Nath, A.K. and Manna, I. (1995): Laser Surface Alloying Copper with Chromium. Presented at the 49th Annual Technical Meeting of the Indian Institute of Metals held in Calcutta, India, November 1995.
110. Manna, I., **Dutta Majumdar, J.,** Chatterjee, U.K. and Nath, A.K. (1995): Laser Surface Alloying of Cr in Pure Cu. Presented at the National Laser Symposium of the Indian Laser Association held at I.R.D.E., DehraDun, India, February 1995.
111. **Dutta Majumdar, J.,** Chatterjee U.K. and Manna, I. (1995): Improving Wear Resistance of Pure Copper and Pitting Corrosion Resistance of Stainless Steel by Laser Surface Engineering. Presented at the 6th Annual General Meeting of the Materials Research Society of India held at the I.I.T., Kharagpur, India, February 1995.
112. Manna, I., Sinha, V., **Dutta Majumdar, J.,** Kale, G.B. and Goswami, G.L. (1994): Improving Wear Resistance of Steel by Laser Surface Alloying. Presented at the 48th Annual Technical Meeting of the Indian Institute of Metals held at Visakhapatnam, India, November 1994.
113. **Dutta Majumdar, J.,** and Manna, I. (1994): Mathematical Modelling of Laser Surface Alloying. Presented at the 48th Annual Technical Meeting of the Indian Institute of Metals held at Visakhapatnam, India, November 1994.
114. **Dutta Majumdar, J.,** Manna, I., Joshi S.V. and Bharti, A. (1993): Laser Surface Alloying of Mo on 304 Stainless Steel. Presented at the 47th Annual technical Meeting of the Indian Institute of Metals held in Hyderabad, India, November 1993.
115. **Dutta Majumdar, J.,** Manna, I., Chatterjee U.K. and Nath, A.K. (1993): Laser Surface Alloying of Cu with Cr. Presented at the National Seminar on Interfacial & Surface Phenomena in Metallurgy held in Varanasi (B.H.U.), India, September-October 1993.

116. **Dutta Majumdar, J.,** and Manna, I. (1992): Boundary Diffusion Aided Surface Treatment of Cu (Al) and Al (Cu) Systems. Presented at the 46th Annual Technical Meeting of the Indian Institute of Metals, held in Udaipur, India, November 1992.

Invited Lectures Delivered

1. **"Laser Composite Surfacing"** delivered as an invited talk at MNIT Hamidpur on 27th August, 2018.
2. **"Ultra-fast Laser Assisted Surface Processing of Metallic Materials"** Delivered in the conference on Advances in Functional and Smart Materials (AFSM), held in AMPRI, Bhopal on 13<sup>th</sup> January, 201
3. **"Laser Composite Surfacing of Metals"** delivered as an invited talk at ARCI, Hyderabad on 16<sup>th</sup> November, 2016.
4. **"Wear Behavior of Hydroxyapatite based Composite Coating on Ti-6Al-4V for Bio-implant Application"**, delivered as an invited talk in the 70th Annual Technical Meeting (ATM) of the Indian Institute of Metals organized in Indian Institute of Technology Kanpur during November 11<sup>th</sup> to 13<sup>th</sup>, 2016.
5. **"Surface Designing of Titanium for Bio-implant Application"**, delivered as the keynote talk in the 4<sup>th</sup> International Conference on Advances in Materials and Materials Processing organized at Indian Institute of Technology Kharagpur during 5<sup>th</sup> to 7<sup>th</sup> November, 2016.
6. **Ultra-fast Laser Assisted Surface Processing of Metallic Materials** by Jyotsna Dutta Majumdar delivered in BARC as an Invited talk on 30<sup>th</sup> June, 2016.
7. **"Laser Assisted Macro and Nano Designing of Ti-6Al-4V Surface for Bio-implant Application"** by Jyotsna Dutta Majumdar, delivered in IIT Bombay as an Invited Talk on 29<sup>th</sup> June, 2016.
8. **"Surface Engineering of Metals using Nanosecond (ns) and Femtosecond (fs) Laser"** delivered as an invited talk on 9<sup>th</sup> May, 2016 organized by IIT Guwahati.
9. **"Laser Assisted Ablation, Surface Texturing and Deposition of Materials"**, delivered as an invited talk on 8<sup>th</sup> April, 2016 organized by IIM Kalpakkam Chapter.
10. **"Laser Assisted Topographical Modification of Ti-6Al-4V Surface and its Effect on Properties"** at Karlsruhe Institute of Technology, Germany, February, 2016.
11. **"Studies on Nitrided and Nitrogen-Ion Implanted Ti-6Al-4V Thin Film Developed by Sputter Deposition on AISI 316L Stainless Steel Substrate"**, delivered as an Invited talk in the National Workshop on Tribology organized by Tribological Society of India, Bhopal during 21-22<sup>nd</sup> January, 2016.
12. **"Advances in surface treatment for carburizing (for gear application)"** at KALYANI CENTRE FOR TECHNOLOGY & INNOVATION-BFL, KESHAVNAGAR, PUNE-411036, March, 2016.
13. **"Nano-Textured Surface on Titanium for Bio-implant Application"** at Helmholtz-Zentrum Geesthacht Zentrum für Material- und Küstenforschung, Geesthacht, Deutschland/Germany, 7<sup>th</sup> November, 2015.
14. **"Nano and Femto second Laser Assisted Materials Processing"** at Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS, September, 2015.
15. **"Laser Assisted Macro and Nano Designing of Ti-6Al-4V Surface for Bio-implant Application"** at Radboud university medical center P.O.Box 9101, 6500 HB Nijmegen (309), The Netherlands, August, 2015.
16. **"Laser Surface Engineering of Titanium and its Alloys for Bio-implant Application"** at Kolkata (3rd International Conference on Laser and Plasma Application in Materials Science, January, 2015.

17. Dutta Majumdar J. (2012): “Microstructural design of copper based shape memory alloy” delivered in University of Munster (host: Professor Gerhard Wilde, Director, Institute of Applied Physics) on 26<sup>th</sup> July.
18. Dutta Majumdar J. (2012): “Thermal Barrier Coating” delivered in DLR, Koln (host: Dr. U. Schultz, Head, High Temperature Coating Division) delivered 13<sup>th</sup> June.
19. Dutta Majumdar J. (2012): “Microstructural Designing and Process Optimization in Laser Surface Engineering” delivered in the Institute of Laser Technique (ILT), Aachen (Host: Dr. Andreas Weisheit, Scientist, Materials Processing Group) on 14<sup>th</sup> June.
20. Dutta Majumdar J. (2012): “Multi-scale Microstructural Control in Laser Surface Engineering” in Ruhr University, Bochum (Host: Prof. Andreas Ostendorf, Director, Mechanical Engineering Department) on 27<sup>th</sup> June.
21. **Dutta Majumdar J** (2011): **Surface Engineering to Improve Cavitation Corrosion Resistance**” an invited lecture delivered at the Bengal Engineering and Science University, Howrah on 1<sup>st</sup>-2<sup>nd</sup> March, 2011.
22. **Dutta Majumdar J** (2011): **Materials for Thermal Barrier Coating and its Applications**” an invited lecture delivered at the TATA Steel on 16<sup>th</sup> September, 2011.
21. **Dutta Majumdar J** (2011): **Laser Surface Engineering of Magnesium and its Alloys for Improved Wear and Corrosion Resistance**, an invited lecture delivered at the National Aerospace Laboratory, Bangalore on 6<sup>th</sup> August, 2011.
22. **Dutta Majumdar J** (2011): **Laser Composite Surfacing for Improved Wear Resistance**, an invited lecture delivered at the National Institute of Technology Rourkela, on 2<sup>nd</sup> September, 2011.
23. **Dutta Majumdar J** (2011): **Coatings in Batteries and Super-capacitors**” at the EICON Workshop and School on “Nanomaterials Issues in Electrochemical Energy Conversion: Fuel Cells, Batteries and Supercapacitors” held in Espoo, Finland during 13<sup>th</sup> to 17<sup>th</sup> June, 2011.
24. **Dutta Majumdar J.** (2011): **Laser Surface Modification of Ti-6Al-4V for Bio-implant Application** delivered at the Metallix, held in Jadavpur University during January 9-10, 2011.
25. **Dutta Majumdar J.** (2011): **Fabrication of Components by Direct Laser Cladding**, an invited lecture delivered at the Materials Science Section of the Indian Science Congress held in Madras during January 3-7, 2011.
26. Dutta Majumdar J. (2010): **Laser Assisted Micro and Nano-structuring of Ti-6Al-4V for bio-implant Application**, an invited lecture delivered at the 50<sup>th</sup> National Laser Symposium held in Indore during December 3-5, 2010.
27. **Dutta Majumdar J.** (2010): **Surface Designing of Ti-based Alloys for Bio-implant Application**” an invited lecture delivered at the Interface on Biological Research, Karlsruhe Institute of Technology, Karlsruhe, Germany on 28<sup>th</sup> September, 2010.
28. **Dutta Majumdar J.** (2010): **Surface Oxidizing and Nitriding of Ti-6Al-4V for Bio-implant Application**” an invited lecture delivered at the Institute of Nano-Technology, Chinese Academy of Science, Beijing, China on 1<sup>st</sup> July, 2010.
29. **Dutta Majumdar J.** (2010): **‘Surface Engineering of Ti-6Al-4V for Bio-implant Application’** an invited lecture delivered at the National Metallurgical Laboratory, SERC, CSIR, Taramani, Madras on March 12, 2010.
30. **Dutta Majumdar J.** (2010): **Surface Engineering for Improving Corrosion Resistance of Marine Structures**, at the International Workshop on Application of Coating in Marine Components’ held in Pune during February 5-6, 2010.

31. **Dutta Majumdar J. (2010):** Laser Composite Surfacing for Improved Tribological Performance of Component, at the Workshop on Application of Lasers in Mechanical Industry (WALMI-2010) held in Jadavpur, Kolkata during January 8-9, 2010.
32. **Dutta Majumdar, J. and Manna I. (2010):** Pulsed laser Deposition of Ti and TiO<sub>2</sub> on Ti-6Al-4V for Bio-implant Application, at the Materials Science Section of the Indian Science Congress (ISC-2010) held in Trivundrum, India, during January 3-7, 2010.
33. **Dutta Majumdar, J. (2009):** Laser Surface Engineering of Ti-6Al-4V for Bio-implant Application, at the International Conference on Surface Modification Technology (SMT-23) held in Mamallapuram, Chennai, India, Nov. 2-5, 2009
34. **Dutta Majumdar, J. (2009):** Laser Assisted Cutting, delivered at the National Laser Centre, C. S. I. R., Pretoria, South Africa, May 27, 2009.
35. **Dutta Majumdar, J. (2009):** Laser Assisted Welding, delivered at the National Laser Centre, C. S. I. R., Pretoria, South Africa, June 3, 2009.
36. **Dutta Majumdar, J. (2009):** Laser Surface Engineering, delivered at the National Laser Centre, C. S. I. R., Pretoria, South Africa, July 1, 2009.
37. **Dutta Majumdar, J. (2009):** Selected Studies on Physical Vapor Deposition, delivered at the African laser Centre, C. S. I. R., Pretoria, South Africa, July 3, 2009.
38. **Dutta Majumdar, J. (2009):** Laser Surface Engineering of Ti-6Al-4V, delivered at the National Laser Centre, C. S. I. R., Pretoria, South Africa, July 15, 2009.
39. **Dutta Majumdar, J. (2009):** Development of TiN coating on AISI 316L Stainless Steel by Cathodic Arc Evaporation at the Workshop on ‘Advances in Steel Metallurgy’ organized by DAAD-Eastern Region, Puri, India, March 21-22, 2009.
40. **Dutta Majumdar, J. (2009):** Surface Nitriding of Ti-6Al-4V for Bio-implant Application at the National Seminar on Advanced Surface Engineering held in National Aeronautical Laboratory, Bangalore, India, February 25-26, 2009.
41. **Dutta Majumdar, J. (2008):** Laser Assisted Shaping of Materials at the Workshop on ‘structure Property Correlation’ organized by DAAD-Eastern Region, Chandipur, India, December 13-14, 2008.
42. **Dutta Majumdar, J. (2009):** Laser Surface Engineering of Ti-6Al-4V for Orthopedic Application. Proceedings of the Workshop on Application of Lasers in Materials Processing’ held in Kolkata, India, January 17-18, 2008.
43. **Dutta Majumdar, J. (2008):** ‘Laser Assisted Surface Modification of Ti-6Al-4V for Bio-implant Application’ delivered at the 3<sup>rd</sup> US-African advanced Institute “Environmental and Biological Applications of Lasers, *EBAL 2008*” held in Cairo, Egypt, January 19-28, 2008.
44. **Dutta Majumdar, J. (2008):** Laser Materials Processing Activities in India delivered at the Workshop on ‘Areas of Common Interest between EU and Developing Countries in the field of Laser Technology’ held in Cairo, Egypt, January 30<sup>th</sup>, 2008.
45. **Dutta Majumdar, J. (2007):** ‘Surface Engineering of Copper and its Alloys for Wear Resistance Application’ delivered on 15<sup>th</sup> July at the University of Chile, Santiago.
46. **Dutta Majumdar, J. (2007):** ‘Studies on Copper Based Shape Memory Alloy for Seismic Application’ delivered on 8<sup>th</sup> August at the Dept. of Materials Science, University of Chile, Santiago.
47. **Dutta Majumdar, J., Mordike, B. L. and Manna, I. (2006):** Laser Surface Engineering of Magnesium Alloys for Automotive Applications. Proceedings of the conference on “Advanced Materials Science and Technology” held in Cairo, Egypt, November 2006, 13-16.

48. **Dutta Majumdar, J. (2006):** Laser Assisted Forming of Austenitic Stainless Steel. Proceedings of the conference on “Advanced Materials Science and Technology” held in Cairo, Egypt, November 2006, 13-16.
49. **Dutta Majumdar, J. (2006):** Surface Treatment of Steel. Delivered at the Short term course on “Heat Treatment of Steel” organized by the Indian Foundrymen Institute, held in Howrah, India, November 2006.
50. **Dutta Majumdar, J. and Manna, I. (2006):** Development of Nano-Surfacing by Laser Surface Engineering. Delivered at the Theme Meeting on Nano structured Coating held in Kolkata, India, March 2006.
51. **Dutta Majumdar, J. (2005):** Surface Engineering. Delivered at the High Pressure Lab, UNIPRESS, 29/37 Swokolowski, Warsaw, Poland, September 2005.
52. **Dutta Majumdar, J. (2005):** Optical Microscopy. Delivered at the short term course organized by Materials Characterization Division, R&D, Tata Iron and Steel Company, Jamshedpur, India, April 005.
53. **Dutta Majumdar, J. (2005):** Corrosion and Surface Protection. Delivered at the short term course organized by Tata Engineering and Locomotive Company, Jamshedpur, India, May 2005.
54. **Dutta Majumdar, J. (2005):** Laser Surface Engineering of Magnesium Alloys for Wear and Corrosion Resistance Application. Delivered at the Dept. Of Metal. & Maters. Engg., I. I. T., Madras, organized by the Indian Institute of Metals, Chennai chapter, India, June 2005.
55. **Dutta Majumdar, J. (2005):** Laser Surface Engineering of Ti for Aerospace Application. Delivered at the Dept. Of Metal. & Maters. Engg., I. I. T., Bombay, organized by the Indian Institute of Metals, Mumbai chapter, India, June 2005.
56. **Dutta Majumdar, J. (2004):** Laser Surface Alloying of Ti with Si and Al for Improved Wear and Oxidation Resistance. Delivered at the Surface Engineering Group (Host Professor: Prof. Bell, T.), Dept. of Materials Engineering, University of Birmingham, UK, May 2004.
57. **Dutta Majumdar, J. (2003):** Laser Surface Modification of Mg and its Alloys. Delivered at the National Laser Symposium held at I. I. T., Kharagpur, India, December 2003.
58. **Dutta Majumdar, J. and Manna, I. (2003):** Thermal Spray Deposition. In the Proceedings of “Conference on Advances in Welding Technology (WELD TECH-2003)” (ed.: Dutta, G.L.) held in I. I. T., Kharagpur, India, March 2003.
59. **Dutta Majumdar, J. (2002):** Heat Treatment of Steel. Delivered in “Training Course for Foundrymen” held in IIF, Calcutta (Organizer: Indian Institute of Foundrymen, Calcutta Chapter), India, August 2002.
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