# Curriculam Vitae


## Dr. Naresh Chandra Murmu, FNAE, FNASc

**Chief Scientist/ Scientist -G**
**Head, Surface Engineering and Tribology Group**
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## Educational Qualifications

- **B.E.,** 1992, Mechanical Engineering, IIEST, Sibpur, India
- **M.E**., 1994, Mechanical Engineering, Indian Institute of Science, Bangalore, India
- **Ph.D**, 2010, Mechanical Engineering, Indian Institute of Technology (BHU), Varanasi, India

## Professional Experience

- ***Visiting Scientist***, **Northwestern University, USA** (2011-2012) (*on Deputation*)
- ***Visiting Scientist,* University of Erlangen-Nuremberg, Germany** (2001-2003) (*on Deputation*)
- Scientist, **National Aerospace Laboratories**, Bangalore (1994-2003)
- ***Scientist***, CISR-Central Mechanical Engineering Research Institute, Durgapur (2003-till date)

## Awards and Distinctions

- **Fellow of National Academy of Sciences, India** (NASI) 2022
- **Fellow of Indian National Academy of Engineering** (INAE) 2019
- **VASVIK Award** (Mechanical & Structural Sciences & Technology) 2015
- **National Design Award** *(Mechanical Engineering)* NDRF (2012)
- **CSIR@70** Recognition for Developing Five Axis Micro Milling Machine (2012)
- **CSIR-Raman Research Fellowship** (2012)
- **DAAD fellowship -2001** (*German Academic Exchange Programme*).
- **Co-Author of MSEB Best Paper Award**, 2014 (Elsevier)

## Editorship/Member

- **Associate Editor**, Journal of the Institute of Engineers (India) Series –C
- **Co-Guest Editor**, *Sivan, K., &**Murmu, N. C.** (2017). Special Theme: India's Reusable Launch Vehicle Technology Demonstrator: The Future of Space Transportation System.*
- **Member**, CSIR-INAE Consultative Committee.
- **Member**, Expert Advisory Committee-AMT, Department of Science & Technology, New Delhi.
- **Member**, Lubricating Equipment Sectional Committee, PGD19, Bureau of Indian Standard

## Google Citation and Patents

**Peer Reviewed Journals: 111 | Patents: 10 [Granted: 01 Indian, Filed: 7 India & 2 US] | Book Chapters: 4 | Copyrights/Design Reg.:7 | Technology Transfer: 2**

**Google Citation Indices**

| Citation Indices | All | Since 2017 |
|---|---|---|
| Citations | 4698 | 4411 |
| h-index | 38 | 36 |
| i10-index | 94 | 94 |

## Other Administrative Responsibilities in CSIR-CMERI

- Head, Project Monitoring and Evaluation (PME) (May18-Mar21)
- Head, Engineering Services Division (Jan, 17- Apr. 18)
- Chairman, Labour Management Committee
- Chairman, Medical Management Committee
- Chairman, Technical Purchase Committee
- Chairman & Member, Different recruitments /Assessments
- Chairman, Guest House Management Committee
- Chairman, Publication Ethics Committee
- Nodal Officer, RTI (related to Projects)
- Secretary, Research Council, CSIR-CMERI (2018-21)
- Member, Management Council, CSIR-CMERI (2014-16)
- PO, Disciplinary proceedings
- Chairman/Member, Different FFCs
- Member, Collegiums

## Peer Reviewed Journals

1. Shit, S., Bolar, S., Murmu, N. C., & Kuila, T. (2022). Minimal lanthanum-doping triggered enhancement in bifunctional water splitting activity of molybdenum oxide/sulfide heterostructure through structural evolution. ***Chemical Engineering Journal,*** 428, 131131. (**I.F.- 10.652**).

2. Bolar, S., Shit, S., Samanta, P., Murmu, N. C., Kolya, H., Kang, C. W., & Kuila, T. (2022). Conducting scaffold supported defect rich 3D rGO-CNT/MoS2 nanostructure for efficient HER electrocatalyst at variable pH. ***Composites Part B: Engineering***, 230, 109489. (**I.F.- 9.078**).

3. Ghosh, S., Samanta, P., Jang, W., Yang, C. M., Murmu, N. C., & Kuila, T. (2022). Improvement of the Supercapacitor Performance of Nickel Molybdenum Chalcogenides/Reduced Graphene Oxide Composites through Vanadium-Doping Induced Crystal Strain Relaxation and Band Gap Modification. ***ACS Applied Energy Materials***, 5(2), 1528-1541. (**I.F.- 6.024)**.

4. Shit, S., Bolar, S., Kolya, H., Kang, C. W., Murmu, N. C., & Kuila, T. (2022). Assisting the formation of S-doped FeMoO4 in lieu of an iron oxide/molybdenum sulfide heterostructure: A unique approach towards attaining excellent electrocatalytic water splitting activity. ***International Journal of Hydrogen Energy,*** 47(21), 11128-11142. (**I.F.- 5.816)**.

5. Das, R., Bej, S., Murmu, N. C., & Banerjee, P. (2022). Selective recognition of ammonia and aliphatic amines by CN fused phenazine derivative: A hydrogel based smartphone assisted 'opto-electronic nose'for food spoilage evaluation with potent anti-counterfeiting activity and a potential prostate cancer biomarker sensor. ***Analytica Chimica Acta***, 1202, 339597. (**I.F.- 6.558)**.

6. Saha, S. K., Murmu, M., Murmu, N. C., & Banerjee, P. (2021). Synthesis, characterization and theoretical exploration of pyrene based Schiff base molecules as corrosion inhibitor. ***Journal of Molecular Structure***, 1245, 131098. (**I.F.- 2.01**).

7. Kumar, M. P., Dutta, S., & Murmu, N. C. (2021). Tool wear classification based on machined surface images using convolution neural networks. ***Sādhanā,*** 46(3), 1-12. (**I.F.- 0.769**).

8. Das, R., Bej, S., Ghosh, D., Murmu, N. C., Hirani, H., & Banerjee, P. (2021). Stimuli-responsive discriminative detection of Cu2+ and Hg2+ with concurrent sensing of S2-from aqueous medium and bio-fluids by CN fused azophenine functionalized "smart" hydrogel assay@ A potential biomarker sensor for Wilson's disease. ***Sensors and Actuators B: Chemical,*** 341, 129925. (**I.F.- 7.100**).

9. Shit, S., Bolar, S., Murmu, N. C., & Kuila, T. (2021). Tailoring the bifunctional electrocatalytic activity of electrodeposited molybdenum sulfide/iron oxide heterostructure to achieve excellent overall water splitting. ***Chemical Engineering Journal***, 417, 129333. (**I.F.- 10.652**).

10. Shit, S., Samanta, P., Bolar, S., Murmu, N. C., Khanra, P., & Kuila, T. (2021). Synthesis of iron pyrite with efficient bifunctional electrocatalytic activity towards overall water splitting in alkaline medium. ***Bulletin of Materials Science***, 44(3), 1-16. (**I.F.- 1.392**).

11. Shit, S., Samanta, P., Murmu, N. C., Khanra, P., & Kuila, T. (2021). Precursor-Dependent Formation of Iron Pyrite and its Application as Supercapacitor Electrode Material. ***Journal of The Institution of Engineers (India): Series C***, 1-9. (**I.F.- Pending**).

12. Ghosh, S., Paul, A., Samanta, P., Landge, B., Mandal, S. K., Sinha, S., ... & Kuila, T. (2021). Influence of Transition Metals (Cu and Co) on the Carbon-Coated Nickel Sulfide Used as Positive Electrode Material in Hybrid Supercapacitor Device. ***Journal of Composites Science,*** 5(7), 180. (**I.F.- Pending**).

13. Samanta, P., Ghosh, S., Murmu, N. C., & Kuila, T. (2021). Effect of redox additive in aqueous electrolyte on the high specific capacitance of cation incorporated MnCo2O4@ Ni (OH) 2 electrode materials for flexible symmetric supercapacitor. ***Composites Part B: Engineering***, 215, 108755. (**I.F.- 7.635**).

14. Mahato, P., Banerjee, P., Murmu, M., Hirani, H., Murmu, N. C., & Mishra, S. K. (2021). Investigation on Multifunctional Properties of Sputtered Ti-Si-BC Coating with Varied Thickness over Targeted Surface. ***Journal of Materials Engineering and Performance***, 1-13. (**I.F.- 1.652**).

15. Sengupta, S., Murmu, M., Murmu, N. C., & Banerjee, P. (2021). Adsorption of redox-active Schiff bases and corrosion inhibiting property for mild steel in 1 molL− 1 H2SO4: Experimental analysis supported by ab initio DFT, DFTB and molecular dynamics simulation approach. ***Journal of Molecular Liquids***, 326, 115215. (**I.F.- 5.065**).

16. Bolar, S., Shit, S., Samanta, P., Murmu, N. C., & Kuila, T. (2021). The structure–activity correlation of bifunctional MnO 2 polymorphoric and MoS 2-based heterostructures: a highly efficient, robust electrochemical water oxidation and reduction reaction catalyst in alkaline pH. ***Sustainable Energy & Fuels***, 5(4), 1148-1157. (**I.F.- 5.503**).

17. Bolar, S., Shit, S., Murmu, N. C., Samanta, P., & Kuila, T. (2021). Activation Strategy of MoS2 as HER Electrocatalyst through Doping-Induced Lattice Strain, Band Gap Engineering, and Active Crystal Plane Design. ***ACS Applied Materials & Interfaces***, 13(1), 765-780. (**I.F.- 8.758**).

18. Shit, S., Ghosh, S., Samanta, P., Bolar, S., Murmu, N. C., & Kuila, T. (2021). Optimization of specific capacitance and water splitting efficiency of N-enriched carbon by incorporating oxides of transition metals via an ancient chemical technique. ***Journal of Electroanalytical Chemistry***, 880, 114929. (**I.F.- 3.218**).

19. Bolar, S.; Shit, S.; Kumar, J. S.; Murmu, N. C.; Ganesh, R. S.; Inokawa, H.; Kuila, T. Optimization of Active Surface area of Flower like MoS2 using V-doping towards Enhanced Hydrogen Evolution Reaction in Acidic and Basic Medium. ***Applied Catalysis B: Environmental,*** **2019,** 254, 432-442.**(I.F.- 16.683).**

20. Shit, S., Samanta, P., Bolar, S., Murmu, N. C., &Kuila, T. (2020). Alteration in Electrocatalytic Water Splitting Activity of Reduced Graphene Oxide Through Simultaneous and Individual Doping of Lewis Acid/Base Center. ***Electrochimica Acta, (I.F. -6.216)***, 137146.

21. Ball, A. K., Roy, S. S., Kisku, D. R., Murmu, N. C., & dos Santos Coelho, L. (2020). Optimization of drop ejection frequency in EHD inkjet printing system using an improved Firefly Algorithm. ***Applied Soft Computing*. (I.F.:5.472)**106438.

22. Ball, A. K., Das, R., Roy, S. S., Kisku, D. R., & Murmu, N. C. (2020). Modeling of EHD inkjet printing performance using soft computing-based approaches. ***Soft Computing,* (I.F.:3.05)** 24(1), 571-589.

23. Ball, A. K., Roy, S. S., Kisku, D. R., & Murmu, N. C. (2020). A New Approach to Quantify the Uniformity Grade of the Electrohydrodynamic Inkjet Printed Features and Optimization of Process Parameters Using Nature-Inspired Algorithms. ***International Journal of Precision Engineering and Manufacturing***, **(I.F. -1.49)** 21(3), 387-402.

24. Das, R., Ball, A. K., Roy, S. S., & Murmu, N. C. (2020). A Multi Criteria Decision Making Approach for Process Improvement of E-JET: An Experimental Investigation. ***Journal of Advanced Manufacturing Systems***. **(I.F.: 0.42)** 19(03), 463-497

25. Mallisetty, P. K., Samanta, P., & Murmu, N. C. (2020). Nonlinear transient analysis of rigid rotor mounted on externally pressurized double-layered porous gas journal bearings accounting velocity slip. ***Journal of the Brazilian Society of Mechanical Sciences and Engineering,(*I.F. -1.698)**, 42(10), 1-12.

26. Paul, S., Das, R., Seth, M., Hirani, H., Murmu, N. C., & Banerjee, P. (2020). A urea functionalized chemoreceptor for expeditious chromogenic recognition of toxic industrial pollutants Cu2+ and CN-from real water sources and bio-fluids: Diagnosis of Wilson's disease from human urine. ***Industrial & Engineering Chemistry Research, (*I.F. -3.573)**.

27. Sengupta, S., Murmu, M., Murmu, N. C., & Banerjee, P. (2020). Adsorption of redox-active Schiff bases and corrosion inhibiting property for mild steel in 1 molL-1 H2SO4: Experimental analysis supported by ab initio DFT, DFTB and molecular dynamics simulation approach. ***Journal of Molecular Liquids***, 115215. ***(*I.F. -5.065)**.

28. Shit, S., Ghosh, S., Samanta, P., Bolar, S., Murmu, N. C., & Kuila, T. (2020). Optimization of specific capacitance and water splitting efficiency of N-enriched carbon by incorporating oxides of transition metals via an ancient chemical technique. ***Journal of Electroanalytical Chemistry***, 114929. ***(*I.F. -3.18)**.

29. Shit, S., Samanta, P., Bolar, S., Murmu, N. C., & Kuila, T. (2020). Alteration in electrocatalytic water splitting activity of reduced graphene oxide through simultaneous and individual doping of Lewis acid/base center. ***Electrochimica Acta,*** 362, 137146. ***(*I.F. -6.216)**.

30. Mondal, A., Hazra, A., Chakrabarty, J., Murmu, N. C., & Banerjee, P. (2020). A Harmonized Applied and Theoretical Exploration for Nanomolar Level Recognition of Perilous F− and CN− by Multichannel Chemosensor: Proposition of Hg2+-Mediated Logic Gate Imitator. ***Chemistry Select***, 5(38), 11976-11985. ***(*I.F. -1.811)**.

31. Shit, S., Bolar, S., Murmu, N. C., & Kuila, T. (2020). An account of the strategies to enhance the water splitting efficiency of noble-metal-free electrocatalysts. ***Journal of Energy Chemistry. (*I.F. -7.216)**.

32. Ghosh, S., Samanta, P., Samanta, P., Murmu, N. C., &Kuila, T. (2020). Investigation of electrochemical charge storage efficiency of NiCo2Se4/RGO composites derived at varied duration and its Asymmetric supercapacitor device. ***Energy &Fuels,(*I.F. -3.421)**.

33. Bolar, S., Shit, S., Murmu, N. C., &Kuila, T. (2020). FeNiSx@ MoS2 Heterostructure: A Bioinspired Nonprecious Electrocatalyst for the Hydrogen Evolution Reaction in Acidic and Basic Media. ***ChemElectroChem,*** 7(15), 3324-3335,**(I.F. -4.154)**.

34. Shit, S., Ghosh, S., Bolar, S., Murmu, N. C., &Kuila, T. (2020). Understanding the Synergistic Effect in Oxygen Evolution Reaction Catalysis from Chemical Kinetics Point of View: An Iron Oxide/Nickel Oxide Case Study. ***Journal of The Electrochemical Society***, *167*(11), 116514,**(I.F. -3.662)**.

35. Hazra, A., Bej, S., Mondal, A., Murmu, N. C., & Banerjee, P. (2020). Discerning Detection of Mutagenic Biopollutant TNP from Water and Soil Samples with Transition Metal-Containing Luminescence Metal–Organic Frameworks. ***ACS omega,*** *5*(26), 15949-15961,**(I.F. -2.58)**.

36. Murmu, M., Saha, S. K., Bhaumick, P., Murmu, N. C., Hirani, H., & Banerjee, P. (2020). Corrosion inhibition property of azomethine functionalized triazole derivatives in 1 mol L− 1 HCl medium for mild steel: Experimental and theoretical exploration. ***Journal of Molecular Liquids***, 113508, **(I.F. -5.065)**.

37. Ghosh, S., Samanta, P., Murmu, N. C., & Kuila, T. (2020). Investigation of electrochemial charge storage in nickel-cobalt-selenide/reduced graphene oxide composite electrode and its hybrid supercapacitor device. ***Journal of Alloys and Compounds***, 155432, **(I.F. -4.650)**.

38. Das, R., Roy, S. S., & Murmu, N. C. (2020). An experimental investigation for parametric appraisal of electrohydrodynamic-driven microfabrication approach using teaching and learning-based optimization. ***Journal of the Brazilian Society of Mechanical Sciences and Engineering***, *42*(5),**(I.F. -1.689)**.

39. Samanta, P., Ghosh, S., Samanta, P., Murmu, N. C., &Kuila, T. (2020). Alteration in capacitive performance of Sn-decorated MnO2 with different crystal structure: An investigation towards the development of high-performance supercapacitor electrode materials. ***Journal of Energy Storage***, *28*, 101281,**(I.F. -3.762)**.

40. Bej, S., Das, R., Murmu, N. C., & Banerjee, P. (2020). Selective Identification and Encapsulation of Biohazardous m-Xylene among a Pool of Its Other Constitutional C8 Alkyl Isomers by Luminescent d10 MOFs: A Combined Theoretical and Experimental Study. ***Inorganic Chemistry***, *59*(7), 4366-4376,**(I.F. -4.85)**.

41. Bolar, S., Shit, S., Murmu, N. C., &Kuila, T. (2020). Doping-Assisted Phase Changing Effect on MoS2 Towards Hydrogen Evolution Reaction in Acidic and Alkaline pH. *ChemElectroChem*, *7*(1), 336-346, **(I.F. -4.154)**.

42. Murmu, M., Sengupta, S., Pal, R., Mandal, S., Murmu, N. C., & Banerjee, P. (2020). Efficient tribological properties of azomethine-functionalized chitosan as a bio-lubricant additive in paraffin oil: experimental and theoretical analysis. *RSC Advances*, *10*(55), 33401-33416, **(I.F. -3.07)**.

43. Paul, G., Hirani, H., Kuila, T., & Murmu, N. C. (2019). Nanolubricants dispersed with graphene and its derivatives: an assessment and review of the tribological performance. ***Nanoscale.*** (**I.F.- 6.895**), 11(8), 3458-3483.

44. Adak, N. C., Chhetri, S., Murmu, N. C., Samanta, P., Srivastav, S.,& T. Kuila(2019). Synergistic effect of Fe3O4 anchored N-doped rGO hybrid on mechanical, thermal and electromagnetic shielding properties of epoxy composites. ***Composites Part B: Engineering***, (**I.F 7.635**)166, 371-381

45. Ball, A. K., Das, R., Roy, S. S., Kisku, D. R., & Murmu, N. C. (2019). Experimentation modelling and optimization of electrohydrodynamic inkjet microfabrication approach: a Taguchi regression analysis. ***Sādhanā***, (**I.F. -0.769)**44(7), 167.

46. Murmu, M., Saha, S. K., Murmu, N. C., & Banerjee, P. (2019). Amine cured double Schiff base epoxy as efficient anticorrosive coating materials for protection of mild steel in 3.5% NaCl medium. ***Journal of Molecular Liquids.*** (**I.F.- 5.065**) 278, 521-535.

47. Paul, G., Shit, S., Hirani, H., Kuila, T., & Murmu, N. C. (2019). Tribologicalbehavior of dodecylamine functionalized graphene nanosheets dispersed engine oil nanolubricants. ***Tribology International***, (**I.F.- 4.271**)131, 605-619

48. Murmu, M., Saha, S. K., Murmu, N. C., & Banerjee, P. (2019). Effect of stereochemical conformation into the corrosion inhibitive behaviour of double azomethine based Schiff bases on mild steel surface in 1 mol L− 1 HCl medium: An experimental, density functional theory and molecular dynamics simulation study. ***Corrosion Science***, (**I.F.- 6.479**). 146, 134-151

49. Adak, N. C., Chhetri, S., Murmu, N. C., Samanta, P., Kuila, T., & Lee, J. H. (2019). Experimental and numerical investigation on the mechanical characteristics of polyethylenimine functionalized graphene oxide incorporated woven carbon fibre/epoxy composites. ***Composites Part B: Engineering***, (**I.F.- 7.635**). 156, 240-251

50. Sharath Kumar J, GhoshS. ,Murmu, N. C., Mandal, N., Kuila Tapas (2019), Electrochemical detection of H2O2 using copper oxide-reduced graphene oxide heterostructure, ***Journal of Nanoscience and Nanotechnology***, (**I.F.- 1.354**) 19(8), 5295-5302

51. Saha, S., Jang, W., Murmu, N. C., Koo, H., &Kuila, T. (2019). Optimization of Chemi-adsorption, EDLC, and Redox Capacitance Through Electro-precipitation Synthesis of Fe3O4/NiO@ rGO/h-BN for the Development of Hybrid Supercapacitor. ***ChemistrySelect,*** (**I.F.- 1.505**) 4(2), 589-599.

52. Adak, N. C., Chhetri, S., Murmu, N. C., Samanta, P., & Kuila, T. (2019). Analytical and experimental investigation on magnetorheological behavior of CoFe 2 O 4-rGO-incorporated epoxy fluid composites. ***Advanced Composites and Hybrid Materials***, 2(2), 266-278. (**I.F.- Pending**)

53. Chhetri, S., Samanta, P., Murmu, N. C., &Kuila, T. (2019). Anticorrosion Properties of Epoxy Composite Coating Reinforced by Molybdate-Intercalated Functionalized Layered Double Hydroxide. ***Journal of Composites Science***, 3(1), 11. (**I.F.- Pending**)

54. Adak, N. C., Chhetri, S., Sabarad, S., Roy, H., Murmu, N. C., Samanta, P., & Kuila, T. (2019). Direct observation of micro delamination in graphene oxide incorporated carbon fiber/epoxy composite via in-situ tensile test. ***Composites Science and Technology***, (**I.F.- 7.094**), 177, 57-65.

55. Shit, S.; Chhetri, S.; Jang, W.; Murmu, N. C.; Koo, H.; Samanta, P.; ***Kuila, T***. (2018). Cobalt sulphide/nickel sulphide heterostructure directly grown on nickel foam: an efficient and durable electrocatalyst for overall water splitting application. ***ACS Applied Materials and Interface*****, (I.F.- 8.758**)10, 27712-27722.

56. Chhetri, S.; Adak, N. C.; Samanta,P.; Murmu,N. C.; Kuila, T.(2018). Exploration of mechanical and thermal properties of the cetyltrimethylammonium bromide modified molybdenum disulfide ($MoS_2$)/Linear low density polyethylene composites prepared by melt mixing. ***Journal of Composite Sciences*****,** 2, 37**. (I.F.- Pending**).

57. Chhetri, S.; Adak, N. C.; Samanta, P.; Murmu, N. C.; Kuila, T. (2018). Rheological, mechanical, and thermal properties of silane grafted layered double hydroxide/epoxy composites. ***Industrial & Engineering Chemistry Research*****.**57, 8729-8739**. (I.F.- 3.573**).

58. Adak, N. C.; Chhetri, S.; Kuila, T.; Murmu, N. C.; Samanta, P.; Lee J. H.(2018). Effect of hydrazine reduced graphene oxide on Inter-laminar Fracture Toughness of woven carbon fiber/epoxy composite. ***Composite Part B: Engineering*****,** (**I.F.- 7.635**)149, 22-30.

59. Saha, S.; Kumar, J. S.; Murmu, N. C.; Samanta, P.; Kuila, T. (2018). Controlled electrodeposition of Iron oxide/Nickel oxide@Ni for the investigation of the effect of stoichiometry and particle size on energy storage and water splitting application. ***Journal of Materials Chemistry A,*** **(I.F.-11.301**).6, 9657-9664.

60. Kumar, J. S.; Murmu, N. C.; Kuila, T. (2018). Recent trends in the graphene-based sensor for the detection of hydrogen peroxide. ***AIMS Material Science*****,**5, 422-466**. (I.F.- Pending**).

61. Saha, S., Samanta, P., Murmu, N. C., &Kuila, T. (2018). A review on the heterostructure nanomaterials for supercapacitor application.***Journal of Energy Storage,*** **(I.F.-3.762), 17, 181-202.**

62. Chhetri, S., Adak, N. C., Samanta, P., Murmu, N. C., Hui, D., Kuila, T., & Lee, J. H. (2018). Investigation of the mechanical and thermal properties of l-glutathione modified graphene/epoxy composites. ***Composites Part B: Engineering*****, (I.F.- 7.635)** 143, 105-112.

63. Saha, S., Samanta, P., Murmu, N. C., Banerjee, A., Ganesh, R. S., Inokawa, H., &Kuila, T. (2018). Modified electrochemical charge storage properties of h-BN/rGOsuperlattice through the transition from n to p type semiconductor by fluorine doping. ***Chemical Engineering Journal*****, (I.F.- 10.652)** 339, 334-345.

64. Chhetri, S., Adak, N. C., Samanta, P., Mallisetty, P. K., Murmu, N. C., &Kuila, T. (2018). Interface engineering for the improvement of mechanical and thermal properties of covalent functionalized graphene/epoxy composites. ***Journal of Applied Polymer Science*****, (I.F.- 2.52)**135(15).

65. Ghosh, P., Hazra, A., Ghosh, M., Murmu, N. C., & Banerjee, P. (2018). Halide salts and their structural properties in presence of secondary amine based molecule: A combined experimental and theoretical analysis. ***Journal of Molecular Structure*****, (I.F.- 2.011)**1157, 444-449

66. Adak, N. C., Chhetri, S., Kim, N. H., Murmu, N. C., Samanta, P., &Kuila, T. (2018). Static and Dynamic Mechanical Properties of Graphene Oxide-Incorporated Woven Carbon Fiber/Epoxy Composite. ***Journal of Materials Engineering and Performance,*** **(I.F.- 1.652),** 27(3), 1138-1147.)

67. Saha, S. K., Murmu, M., Murmu, N. C., Obot, I. B., & Banerjee, P. (2018). Molecular level insights for the corrosion inhibition effectiveness of three amine derivatives on the carbon steel surface in the adverse medium: A combined density functional theory and molecular dynamics simulation study. ***Surfaces and Interfaces*****, (I.F.- 1.665)**10, 65-73.

68. Adak, N. C., Chhetri, S., Murmu, N. C., Samanta, P., &Kuila, T. (2018). Effect of Thermally Reduced Graphene Oxide on Mechanical Properties of Woven Carbon Fiber/Epoxy Composite. ***Crystals,*** **(I.F.- 2.144)** 8(3), 111.

69. Kumar, J. S., Murmu, N. C., Samanta, P., Banerjee, A., Ganesh, R. S., Inokawa, H., &Kuila, T. (2018). Novel synthesis of a Cu 2 O–graphene nanoplatelet composite through a two-step electrodeposition method for selective detection of hydrogen peroxide. ***New Journal of Chemistry*****, (I.F.- 3.228)** 42(5), 3574-3581.

70. Chhetri, Suman, Nitai Chandra Adak, PranabSamanta, Nilrudra Mandal, Tapas Kuila, and Naresh Chandra Murmu. "Investigation of mechanical and thermal properties of the cetyltrimethylammonium bromide

functionalized molybdenum disulfide (MoS 2)/epoxy composites." *Polymer Bulletin*, (I.F.-1.858).75, no. 1 (2018): 327-343.

71. Ghosh, P.; Roy, P.; Ghosh, A.; Jana, S.; Murmu, N. C.; Mukhopadhyay, S. K. and Banerjee, P*. Explosive and pollutant TNP detection by structurally flexible SOFs: DFT-D3, TD-DFT study and in vitro recognition. ***Journal of Luminescence*, (I.F.-3.280)** 2017, 185,272-278.

72. Saha, S. K., Murmu, M., Murmu, N. C., Obot, I. B., & Banerjee, P. (2018). Molecular level insights for the c orrosion inhibition effectiveness of three amine derivatives on the carbon steel surface in the adverse mediu m: A combined density functional theory and molecular dynamics simulation study. ***Surfaces and Interfacs*** (**I.F.-1.665**) 10, 65-73.

73. Adak, N. C., Chhetri, S., Kim, N. H., Murmu, N. C., Samanta, P., &Kuila, T. (2018). Static and Dynamic Mechanical Properties of Graphene Oxide-Incorporated Woven Carbon Fiber/Epoxy Composite. ***Journal of Materials Engineering and Performance***,(**I.F.-1.652**) 27(3), 1138-1147.

74. Kumar, M. P., De, S., Samanta, P., & Murmu, N. C. (2018). A comprehensive numerical model for double-layered porous air journal bearing at higher bearing numbers. ***Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology***, (**I.F.-1.397**) 232(5), 592-606.

75. Saha, S.; Samanta, P.; Murmu, N. C.; Kuila, T. (2017) Investigation of surface plasmonpolariton and electrochemical property of covalent and non-covalent functionalized reduced graphene oxide. ***Physical Chemistry Chemical Physics.*** (**I.F.-3.430**) 19, 28588 - 28595.

76. Jana, M.; Samanta, P.; Murmu, N. C.; Kuila, T.(2017) Surface modification of reduced graphene oxide through successive ionic layer adsorption and reaction method for redox dominant supercapacitor electrodes. ***Chemical Engineering Journal.*** (**I.F.-10.652**).330, 914-925.

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## Patents

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iii) N. C. **Murmu**, Phani Kumar, Bhagat, A N, **Measuring the Progression of Wear in Wire drawing Die using Acoustic Emission Technique**, (3954DEL2015) on 04/12/2015 (with Tata Steel, Jamshedpur)

iv) P. Samanta, N C **Murmu**, L. G Das, **Foil Bearing and Its Supporting Arrangements**filed on 30/03/2016 (App No-20161101067)

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vi) Jana, M, Kuila, T, Samanta, P, **Murmu**, N. C. **Development of scaled-up Graphine oxide production technology starting from natural flake graphite** [13/02/2017 –CSIR-CMERI].

vii) Kuila, T.; Jana, M.; Samanta, P.; **Murmu, N. C**. **Development of scaled-up graphite oxide productiontechnology starting from natural flake graphite**. Docket no. 36326. CBR. No. 20266, Patent OfficeApplication No. 201711019808, Filled on 06/06/2017 (Ref. No. 0045NF2017).

viii) Kuila, T.; Saha, S.; Samanta, P.; **Murmu, N. C**. **Asymmetric supercapacitor of sulfanilicacidazochromotrop functionalized reduced graphene oxide/hexagonal boron nitride superlattice.** PatentOffice Application No. 201711029465, Filed on 21/08/2017 (Ref. No. 0072NF2017).

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## Copyrights/Design Registration

i) High Speed Foil Bearing Housing for Small Turbo Machines (Ref. CSIR-CMERI/IPMG/DR/2014/1)

ii) Drawings of seven components of "A Five Axis Micro Milling Machine" [Ref. CSIR-CMERI /IPMG/Copyright /2012/3]

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iv) A Desktop Dip pen Nanolithography system [filed 25/01/2017: CSIR-CMERI].

v) An initiative in waste sludge management for disposed material of fluoride removal water filter plant [filed 22/02/2017: CSIR-CMERI].

vi) Novel approach for FeIII promoted fusion reaction towards application in dip pen nano lithography [filed 29/01/2017: CSIR-CMERI].

vii) Plasma treatment of hospital waste [filed 29/01/2017: CSIR-CMERI].

## Technology Transfer

**a) Large Scale Graphene Oxide Production Technology: Rs. 17.25 Lacs 9 (Non-Exclusive Basis)**
This was transferred to **M/s AUROPOL India Pvt. Ltd** (Specialty Chemical Industry with more than 20 Cr. Turnover and having sales coverage in South Eas Asia, Middle east and Europe). The candidate has contributed in designing special type of cooling jacket without involvement of costlycooling coil. Further he developed special type of innovative filtration process thus reducing the cost of (Research Grade) graphene production to Rs. 10.34 per gram.https://techindiacsir.anusandhan.net/online/Control.do?_sucstr

**b) Smart Dimmable Led Street Lighting System**
Technology is transferred to M/S Koley Engineering Works, Howrah @ Rs. 5 Lakhs (Non-Exclusive Basis)IPR Status: Copyright, Name "Electrical Drawings of Intelligent Street Light Control System", registration No. L-86487/2019 dated 22/10/2019**.** The aforesaid developed technology will save up to 60% of the energy consumption in comparison with conventional LED Street Lighting system. Such a system comprising of 1000 light poles will save 116 metric ton of carbon footprint in a year.

## Book Chapters

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2. Kuila, T.; Dong, Y. S.; **Murmu, N. C.** "Graphene/conjugated polymer nanocomposites for optoelectronic and biological applications" in "Fundamentals of Conjugated Polymer Blends, Copolymers and Composites: Synthesis, Properties, and Applications" Ed. P. Saini, ISBN: 978-1-118-54949-0, WILEY-Scrivener Publisher's.
3. Saini, P.; Kuila, T.; Saha, S.; **Murmu, N. C.** "Graphene and its nanocomposites for gas sensing applications" in "Advanced Sensor and Detection Materials" Ed. A. Tiwari and M. M. Demir, ISBN: 978-1-118-77348-2. Wiley, USA .
4. Chhetri, S.; Kuila, T.; **Murnu, N. C.** "Graphene Composites" In "Graphene Technology - From Laboratory to Fabrication". Eds: Soroush Nazarpour and Stephen Waite. Publisher: Wiley-VCH Verlag GmbH & Co. KGaA, July 2016, ISBN: 978-3-527-33833-7.

## Popular Magazines

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2. **Murmu**, N. C., Sudipta De, Tapas Kuila, EHD Ink Jet Printing –Revelation in Nano Manufacturing, Sept, 2013, Nano Digest, 26-28.
3. P. Banerjee, **Murmu**, N. C., Bio essential anions from solutions to nano materials, Nano Digest,NANO DIGEST, Nov, 2013, 24.

## Industry/DST Sponsored Projects

### [On-Going Projects]

- Design, Fabrication and Demonstration of Type-IV Hydrogen storage tank, safety valves and Leak Detectors, **CSIR Mission Project**, [CSIR-CGCRI, Kolkata & CSIR-NIIST, Trivandrum] (Rs. 747.28 Lakh) » **Project Coordinator & Principal Investigator.**
- Establishment of Science Technology & Innovation Hub for Sal Butter at Kanska Block, Paschim Bardhaman District, West Bengal (2022-25) DST, New Delhi (Rs. 62.85 Lacs ) » **Principal Investigator.**
- Design and development of graphene reinforced carbon fiber/epoxy composite based light weight high pressure hydrogen storage cylinder for vehicular application (2020-23), **DST**, New Delhi (Rs. 76.68 Lacs ) with IIT Kanpur » **Principal Investigator.**
- Fabrication of high energy density supercapacitor pouch cell using chemically derived meso-porous graphene-based composite materials (2021-24), **DST**, New Delhi (Rs. 19.08 Lacs ) » **Principal Investigator.**
- Renewable Energy EMPOWERing European and InDian Communities ("RE-EMPOWERED")" (2021-24), **Indo-European Project** (Project Value: Rs. 903 lakhs, CMERI: Rs. 156.85 lakhs) » **Co-Principal Investigator.**
- Design, development and prototyping of state of the art Hybrid Energy Storage System (HESS) based high power high speed Electric Vehicle (EV) drive train for a Multi Utility Vehicle (MUV) (2019-22), **DST**, New Delhi (Rs. 144.452 Lacs for consortium) with NIT-Roukela » **Co-Principal Investigator.**

### [Completed Projects]

- Graphene Ultra Capacitor Module for Hybrid Unmanned Ground Vehicles (UGV) (2017-20), **DRDO,** New Delhi, (Rs. 489 Lacs)» **Principal Investigator.**
- Design and development of Hollow Crankshaft for Automobile (2014-17) **Indo-German Science and Technology Centre (IGSTC)** [Bharat Forge Ltd, Fraunhofer Institute, Germany, Siedel, GmBH, Germany] (Rs.600 Lakh for consortium) » **Principal Investigator.**
- Design and development of Electrohydrodynamic Ink Jet Printing System,(2016-2019), **DST**, New Delhi, (Rs 116 Lacs) with NIT-Durgapur » **Principal Investigator.**
- Design and development of Multi-Material Deposition (MMD) System (2013-17) **DST**, New Delhi, (Rs. 471.52 Lakh). » **Co-Principal Investigator.**
- Developing Manufacturing Technology of Graphene-based Polymer Composite for Mechanically Stable and Thermally Durable Automotive Component, (2017-20209), **DST**, New Delhi (Rs. 30.56 Lacs ) » **Principal Investigator.**
- Surface coating of nylon and stainless steel using graphene-based composite materials (2014-15), **Chonbuk National University, South Korea** (Rs.11 Lakh). » **Co-Principal Investigator.**
- Measuring Progression of Wear in Wire Drawing Process using Acoustic Emission technique (2011-13), **TATA STEEL Jamshedpur** (Rs.14.72 Lakh). »**Principal Investigator.**
- Preliminary Investigation of Graphene-Based Die Lubricants for Hot Forging Application(2014-15), **SONA BLW PRECISION FORGINGS**, (Rs 15 Lakhs) » **Principal Investigator.**
- Investigation of degradation ofhydraulic oil in Hydraulic Power Steering(2014-15) **SONA KOYO STEERING**, (Rs 16.44 Lakhs) » **Co-Principal Investigator.**
- Development of Rolling Element Bearing Testing Stands (2003-05) **TATA BEARINGS & DST**, New Delhi (Rs 39.875 Lakhs). » **Principal Investigator.**
- Acoustic emission based online wireless wear monitoring system (2017-21) **DST**, New Delhi, (Rs. 23.4 Lakh). » **Co-Principal Investigator.**

## CSIR-Network Project as Principal Investigator

### [On-Going Projects]

- Development of Compressed Hydrogen Composite Storage Tank for Fuel Cell Electric Vehicles (2020-23) **CSIR Niche Creating Project** (Rs.200 Lakh) » **Principal Investigator.**
- Development of Ultra-Precision Co-ordinate Measuring Machine(UCMM) with sub-micron range uncertainty (2020-23)**CSIR Niche Creating Project** (Rs.277 Lakh) » **Co-Principal Investigator.**
- Development of Scanning Laser Epitaxy (SLE) Process, (2020-23) **CSIR Focus Basic Research Project** (Rs.50 Lakh) » **Co-Principal Investigator.**

### [Completed Projects]

- Graphene based Acquous Lubricants (2016-18) **CSIR Fast Track Tranlation Research Project**, New Delhi (Rs 119.64 Lakhs). » **Principal Investigator.**
- Graphene-Based Rechargeable Energy Storage Micro Device (2013-17) **CSIR-Network Project**, (Rs.182 Lakh) » **Principal Investigator.**
- Micro/Nano-Scale Surface Patterning (2013-17) **CSIR –Network Project**, (Rs.282 Lakh) » **Principal Investigator.**
- Electro-Hydrodynamic Jet Printing System (2013-17) **CSIR-Network Project CSIR-Network Project**, (Rs.119 Lakh) » **Principal Investigator.**
- µ-Actuator of Magnetic-Fluid Enabled Deformable Mirror for Retinal Imaging Adaptive Optics Systems (2012-17) CSIR –Network Project, (Rs.108 Lakh) » **Principal Investigator.**
- Multi-Material Reconfigurable Micro Manufacturing Systems – (Task3)(2007-12) CSIR –Network Project, (Rs.312 Lakh) » **Principal Investigator.**
- Preliminary Investigation of Dip Pen Nanolithography (2012-16) CSIR –CMERI Project, (Rs. 67.85 Lakh)» **Principal Investigator.**
- Development of Rolling Element Bearing Standards for Aerospace Applications (2004-08) CSIR -Network Project, (Rs. 61 Lakh) » **Principal Investigator.**
- Magnetic Journal Bearing For Miniaturized/ Micro Devices (2013-17) CSIR-Network Project CSIR –Network Project, (Rs.179 Lakh) » **Co-Principal Investigator.**
- Tunable Nanolubrication with nanofluids for meso-micro mechanical system (2013-17) CSIR-Network Project CSIR –Network Project, (Rs.169 Lakh) » **Co-Principal Investigator.**
- Developmental Studies of 5kWGas Turbine-Compressor Set (2011-14) CSIR-CMERI Project (Rs.19.96 Lakh) » **Co-Principal Investigator.**
- Preliminary Investigation on Foil Bearing Development (2011-14) CSIR-CMERI (Rs. 25Lakh) » **Co-Principal Investigator.**
- Investigation of Wear at Tribological Interfaces Characterizing in terms of Acoustic Emission Signals For Possible Application (2011-13) CSIR-CMERI Project, (Rs.19.30) » **Co-Principal Investigator.**
- Evaluation of Tribological and Mechanical Properties of Supper Hard Materials for Strategic Engineering Applications. (2002-07) CSIR-Network Project CSIR –Network Project, (Rs.66Lakh) » **Co-Principal Investigator.**

## Key achievements as Team Leader

- **5kW Micro Turbine** *(demostrated @40,000rpm)*
- **5 Axis Micro-Milling Machine** *(demonstrated milling 100µm feature).*
- **Graphene Super-Capacitor** *(~113W/Kg at device level).*
- **Foil Bearing** *(demonstrated at 30,000rpm)*
- **EHD-Ink Jet Printing**
- **Graphene Lubricant (cof ~0.01**) *for hot forging.*
- **Miniature Turbine (***demonstrated @2.73 Lakh rpm).*
- **Graphene Nano-composite** *(UTS ~46% improvement)*
- **Die Wear Monitoring System** *(successfully tested at TATA Steel, Jamshedpur).*

## PhD Completed as Supervisor/Co-Supervisor

1. Dr. Milan Jana, "Development of Graphene based Electrode Materials for Electrochemical Supercapacitor", January, 2018, (10CC13A12010) jointly with Dr. Tapas Kuila.

2. Dr. Sanjit Saha, "Investigation of the effect of heterostructure and doping of semiconductor materials for high energy density Supercapacitor application", May 2018 (20EE15J12001) jointly with Dr. T Kuila.

3. Dr. Suman Chhetri, "Development of functionalized Graphen/Epoxy composistes for the improvement of mechanical, anti-corrosion and EMI shielding Properties", September 2019, (10CC15A12006) jointly with Dr. T Kuila.

4. Dr. J Sharath Kumar, "Development of Graphene based Electrochemical sensor materials for detection of hydrogen peroxide($H_2O_2$), October, 2019, (10CC15A12007) jointly with Dr. T Kuila.

5. Dr. Phani Kumar Mallisetty, "Investigation of externally pressurized multilayer porous journal bearings", 2019 jointly with Dr. Pranab Samanta.

6. Dr. Amit Kumar Ball (NIT, Durgapur) "Experimental investigation and computational modeling of the Elctrohydrodynamic Ink Jet Printing System" – Amit Kumar Ball (NITD/PHD/CS/2016/00751) jointly with Dr. S.S. Roy and Dr.D. R. Kisku

7. Dr. Subhasis Shit, (AcSIR) "Development of noble-metal-free efficient bifunctional eletrocatalysis for overall water splitting in alkaline medium" –April, 2022(10CC18A12016), jointly with Dr. Tapas Kuila.

8. Dr. Manilal Murmu, "Design, synthesis and ccharacterization of organic molecules for corrosion inhibition of metals: Application of anti-corrosive additives coating materials', –December 2021(10CC16J12005) jointly with Dr. Priyabrata Banerjee.

9. Dr. Suparna Paul, "Development of Sensory probes for expeditious chomo-fluorogenic detection of heavy, toxic cataonic cataminants and lethal anions: Detailed Characterization and Applications', – Febriuary 2022(10CC16A12004) jointly with Dr. Priyabrata Banerjee.

10. Dr. SouravBej, "Design and Synthesis of Supramolecular assembly as sensory reactor for detection of neutral and lethal anionic contaminants" – March 2022 (10CC18A12013) jointly with Dr. Priyabrata Banerjee.

11. Dr. Debanjan Dey, "Development of Schiff base based organic framework/polymers as solvent materials for water immiscible oil and toxic organic solvent cleaner and small molecules for detection of water mischible toxins" – April 2022 (10CC16A12002) jointly with Dr. Priyabrata Banerjee.

## PhD Scholars under Joint Supervision- On-Going

1. Mr. Souvik Ghosh EN of AcSIR:10CC19J12001
2. Ms. AbhijitHazra EN of AcSIR:10CC18J12004
3. Ms. Riyanka Das EN of AcSIR:10CC18A12014
4. Mr. Simeon Babalola EN of AcSIR: 20EE20J12015

## Post Graduation(MTech/MCA) as Supervisor

1) Ms. Puja Ghosal, MTech (NIT Durgapur) 2017
2) Mr. PratikkumarRaje, PGRP(AcSIR) 2014
3) Mr. Nagendra Singh, MTech (NIT Durgapur) 2014
4) Mr. RudraBubai Sarkar, MTech (IIT-BHU) 2013
5) Md. Rehman N, MTech (NIT Durgapur) 2012
6) Dr. Ehteshan Hassan, MTech (NIT Durgapur) 2011
7) Mr. Pankaj Kumar Singh, IIT(ISM) 2010
8) Ms. Sandipa Bhattacharya, MCA, MID, Durgapur, 2010
9) Ms. Bhavna Saxena, MCA, Banasthali University, 2010
10) Ms. Moumita Banik, MCA, Banasthali University, 2010
11) Mr. Ritwik Mondal, MTech (NIT Durgapur) 2010
12) Ms. Sushmita Sarkar, MCA (Banasthali University) 2009
13) Dr. Ravi Shankar Anand, M. Tech (BIT, Mesra) 2008
14) Dr. Deepak Kumar, M. Tech (BIT, Mesra) 2008
15) Dr. Mou Dasgupta, MCA(WBUT) 2007
16) Mr. Ritesh K. Koshti, M. Tech (IIT-BHU) 2006
17) Mr. Anupam Sen, MTech (NIT Durgapur) 2005

## Invited Lecture

- **Murmu, N. C**., Nanolubricants dispersed with graphene and its derivatives: an assessment andreview of the tribological performance –*International virtual Conference on Tribology*, December 10-12, 2020, SRM University and Tribology Society of India.
- **Murmu, N. C.,** Graphene-Based Aqueous Lubricant for Hot Forging Application**,** *International conferenceSynthesis, Characterization and Application ofNanomaterials (SCAN)*, November 1-2, 2019, by Material Research Society, Kolkata.
- **Murmu, N. C.,** Functionalized Graphene & some of it's Applications − R&D @ CSIR-CMERI**,** *32nd National Convention of Metallurgical and Materials Engineers & National Seminar on Advances in Engineering Materials for Sustainable Develioment*, January 18-19, 2019, CSIR-NML, Jamshedpur

- **Murmu, N. C.,** Metal Additive Manufacturing ─ Developing Affordable and Accessible System,*Indo-German BIlateral Workshop on Additive Manufacturing of Metals: Current Issues and way forward.,* February 04-06, 2019, NML, Jamshedpur

- **Murmu, N. C.,** Electro-Hydrodynamic Inkjet for Manufacturing of μ-PatternsPrototype Dev. And Preliminary Investigations, *International Symposium on Aspects of Mechanical Engineering & Technology for Industry*, 6-8 Dec, 2014, NERIST, Itanagar, india.

- **Murmu, N. C.**, Preliminary Studies on Dip Pen Nanolithography, *Indo-US Workshop on Fabrionics*, 23-24 Dec, 2012, CSIR-CMERI, Durgapur, India.

- **Murmu, N. C.,** "*Interoperability of CAD Data Translation- Current Solutions and their issue.*" The Short term Course on "Design and Engineering (CADE-2014)" 06-10 January, 2014; National Institute of Technology, Durgapur.

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