MD AMINUL ISLAM

Post-Doctoral Fellow, Indian Institute of Technology Guwahati, India

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CAREER SUMMARY:

Materials researcher with 8+ years of laboratory and industry based research experience in 2D (graphite, graphene, MoS_2 etc.) materials, and their applications in various applications, e.g. filtrations, supercapacitors, reinforcement in matrix materials etc. Extensive expertise in the creation of statement of work, plant setup development, competitive bidding, and negotiations. I am passionate to contribute in the advancements of new technologies for industries and society.

Education:

2017 - 2023 **PhD in Metallurgical and Materials Engineering**, Indian Institute of Technology (IIT) Patna, India.
Specialization: Thermal spraying, composite coatings, beyond traditional coatings.
Thesis: Beyond Traditional Coatings: Plasma Spray Exfoliated Graphene Reinforced Ceramic membrane. CGPA = 8.4/10.

2013 - 2015 **M.Tech in Nanoscience and Technology**, Pondicherry University, India,
Thesis: Fabrication of manganese doped zirconia thin films by electron beam evaporation, CGPA = 8.2/10.

2008 - 2012 **B.Tech in Electronics and Communication Engineering,** North Eastern Hill University - India, CGPA = 7.2/10.

Research Experience:

2024 – Present **Post-Doctoral Fellow**, at Indian Institute of Technology (IIT), Guwahati, India. Project: Graphene based sensor development for Underwater Exploration at Technology Innovation Hub (TIH), IIT Guwahati.

2023 – 2024 **Post-Doctoral Research Associate**, at Indian Institute of Technology (IIT), Patna, India. Project: Development of Graphene reinforced composite materials at Centre of Excellence, IIT Patna.
Funding Agency: Department of Science and Technology – Govt. of India.

2016 – 2017 **Senior Research Fellow**, at Indian Institute of Technology, Patna sponsored by Department of Science and Technology, Govt. of India.
Project: Fabrication of thermal sprayed multilayered hydroxyapatite coatings for bio-implants application.
Funding Agency: Department of Science and Technology – India.
Supervisor: Prof. Anup Kumar Keshri and Prof. Debrupa Lahiri.

2015 – 2016 **Senior Project Fellow**, at CSIR IMMT, Bhubaneswar, sponsored by CSIR, Govt. of India.
Project: Deposition of tungsten nitride/silicon nitride composite thin films by a reactive co-sputtering technique.
Funding Agency: Council of Scientific & Industrial Research – India.
Supervisor: Dr. Sharmistha Anwar and Dr. Shahid Anwar.

Research Interest:

Understanding the process-microstructure-property correlation in plasma sprayed nanomaterials (graphite, graphene, CNT etc.) reinforced ceramic composite for various engineering applications such as wear, corrosion resistance, next-generation thermal barrier coating etc. In addition, utilization of plasma spraying process beyond traditional coatings, production of exfoliated graphene, graphene-based membranes, sensors etc. Furthermore, the development of graphene based sprayed functional materials to serve power/energy sectors. The broader area of research involves -

- Surface engineering by thermal spraying process (APS, SPPS, HVOF/HVAF etc.).
- Development of nanomaterials (carbon, graphene, CNTs) reinforced ceramic matrix composite coatings.
- Investigation of mechanical, tribological and corrosion resistance properties of the composite coatings.
- Development of thermal sprayed functional coatings for power/energy engineering sectors.
- Characterization of thermal sprayed coating using XRD, FESEM, Raman, HRTEM, and microhardness, tribological, electrochemical performance analysis.
- Application of plasma spraying beyond traditional coatings, such as the production of exfoliated 2D materials (graphene, MoS_2, WS_2, etc.).

Experimental Skills:

- Atmospheric plasma spraying (APS) for fabrication of thermal barrier coating, wear and corrosion resistant coating
- Plasma process parameters optimization for plasma sprayed ceramic-based composite coatings.
- Tailoring the process-microstructure-properties relation for ceramic matrix composite coatings.
- Fabrication of thin films using magnetron sputtering, Electron beam physical vapor deposition (EB-PVD) etc.
- Preparation, characterization of nanomaterials (graphene, MoS_2, WS_2 etc.) and their applications in various proof of concepts.
- Micro, Nanomechanical, wear and corrosion resistance, electrical, electrochemical properties evaluation.

Technical Skills:

❖ **Deposition Techniques:**

- **Thick Coatings**: Atmospheric plasma spraying (APS), Shrouded plasma spraying.
- **Thin films**: Reactive magnetron sputtering, Electron beam physical vapor deposition (EB-PVD), Spin coating.

❖ **Bulk Processing Techniques:**

- Conventional furnace sintering, Selective laser melting (SLM), and Spark plasma sintering.

❖ **Materials Characterization Techniques:**

- **X-ray diffraction analysis:** Grazing incidence X-ray diffraction (GI-XRD), X-ray photoelectron spectroscopy (XPS), Phase determination, crystal structure.
- **Spectroscopic analysis:** Ultraviolet-visible spectroscopy, Raman Spectroscopy, Fourier-transform infrared spectroscopy.
- **Microscopic Analysis:** Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) with Selected Area Electron Diffraction analysis (SAED), Energy-dispersive X-ray spectroscopy (EDX), Atomic Force Microscopy (AFM).
- **Mechanical Analysis:** L-D curves by Micro/Nano-indentation, Indentation Fracture Toughness, elastic and plastic deformation calculations.
- **Tribological analysis:** Co-efficient of friction (COF), wear loss, wear rate calculations by ball/pin on disc high-temperature tribometer.
- **Electrochemical Analysis:** Open circuit potential (OCP), Electrochemical Impedance Spectroscopy (EIS), Cyclic Voltammetry (CV), galvanostatic charging-discharging, Linear sweep voltammetry (LSB), I-V polarization, AC impedance Spectroscopy.
- **Simulation and languages:** SimDrop, GATAN, ImageJ, LATex, Highscore plus, Origin, MATLAB, C/C++, FORTRAN, and Assembly level programming.

Awards and achievements:

2018	Senior Research Fellowship, Department of Science and Technology (DST), Govt. of India.
2016	Junior Research Fellowship, Department of Science and Technology (DST), Govt. of India.
2013-2015	Post Graduate Scholarship for Academic Excellence by Central Government of India at Pondicherry University.
2008-2012	Graduate Scholarship for Academic Excellence by Central Government of India at North Eastern Hill University.
2005	Anundoram Borooah Award for academic excellence by the Government of Assam, India.

Mentoring Activity:

Currently mentoring (Doctoral fellows of Prof. Anup Kumar Keshri)

Pushpender Singh (Batch - 2020)
Sai Kiran P (Batch - 2021)
K. Vijay Kumar (Batch - 2021)
Niranjan Pandit (Batch - 2022)

Rahul Kumar (Batch - 2022) Satish Indupuri (Batch - 2022)

Co-Supervisor of Master students (as a senior scholar of Prof. Anup Kumar Keshri)

Shrestha Ranjan (Batch - 2019) Rohit Gupta (Batch - 2019)
Rakesh Kumar (Batch - 2019) Sumit Choudhary (Batch - 2020)
Rahul Verma (Batch - 2020) Sudha Kumari (Batch - 2021)

Industrial Collaborations:

- Collaborated with Carborundum Universal Limited (CUMI), India for developing plasma sprayed ceramic (YSZ) membranes for water filtration.
- Associated with TATA Steel Limited, India to optimize the plasma process parameters for Fe-based alloy coatings.

Journal Reviewer:

- Surface and Coating Technology - Ceramics International

- Journal of European Ceramic Society - Journal of Alloys and Compounds

Publications Summary:

Journal Paper published:	31	Patent:	04	Conference Paper:	02
Citation:	650	h-index	15	i10-index:	19

Google Scholars Link: https://scholar.google.com/citations?user=tK3ZTNUAAAAJ&hl=en

Peer-reviewed articles:

1. P. Sai Kiran, K. Vijay Kumar, Niranjan Pandit, Satish Indupuri, Rahul Kumar, Vedant Vinod Wagh, **Aminul Islam**, Anup Kumar Keshri, Scaling up Simultaneous Exfoliation and 2H to 1T Phase Transformation of MoS2, **Advanced Functional Materials**, 2024 (**DOI: 10.1002/adfm.202316266**)

2. P Sai Kiran, Satish Indupuri, K Vijay Kumar, **Aminul Islam**, Pushpender Singh, Chintham Satish, Anup Kumar Keshri, Fabrication of nanoporous multilayer graphene nanoplatelets membrane for water desalination, **Desalination**, 575, 117291 (2024)

3. K Vijay Kumar, **Aminul Islam**, P Sai Kiran, Niranjan Pandit, Rahul Kumar, Satish Indupuri, Anup Kumar Keshri, Exfoliation of graphite to turbostratic graphene, **2D Materials**, 11, 015022 (2023)

4. **Aminul Islam**, Bala Praveen Chakkravarthy Raghupathy, Sivakumaran M V, Anup Kumar Keshri, Ceramic Membrane for Water Filtration: Addressing the Various Concerns at Once, ***Chemical Engineering Journal***, 446, 137386 (2022).

5. **Aminul Islam**, Biswajyoti Mukherjee, Krishna Kant Pandey, and Anup Kumar Keshri, Ultra-Fast, Chemical-Free, Mass Production of High-Quality Exfoliated Graphene, ***ACS Nano*****,** 15, 1775 (2021).

6. **Aminul Islam**, Krishna Kant Pandey, Pushpender Singh, Rahul Kumar**,** Anup Kumar Keshri, Microstructural, Mechanical and Tribological Properties of Carbon Nanotubes Reinforced Plasma Sprayed Molybdenum Disulphide composite Coatings, ***Ceramics International***, (2022).

7. **Aminul Islam**, Akanksha Sharma, Puspender Singh, Niranjan Pandit, Anup Kumar Keshri, Plasma-sprayed CeO_2 overlay on YSZ thermal barrier coating: Solution for resisting molten CMAS infiltration, ***Ceramics International***, 48, 14587 (2022).

8. **Aminul Islam**, Kundan Kumar, Krishna Kant Pandey, Biswajyoti Mukherjee, O.S. Asiq Rahman, Anirban Chowdhury, Anup Kumar Keshri, Exceptionally high fracture toughness of carbonnanotube reinforced plasma sprayed lanthanum zirconate coatings, ***Journal of Alloys and Compounds***, 777, 1133 (2019).

9. **Aminul Islam**, Biswajyoti Mukherjee, M. Sribalaji, O.S. Asiq Rahman, P. Arunkumar, K. Suresh Babu, Anup Kumar Keshri, Role of hybrid reinforcement of carbon nanotubes and graphene nanoplatelets on the electrical conductivity of plasma sprayed alumina coating, ***Ceramics International***, 44, 4508 (2018).

10. **Aminul Islam**, Sharmistha Anwar, Shubra Bajpai, Shahid Anwar, Structural and mechanical studies of W_2N embedded Si_3N_4 nanocomposite hard coating prepared by reactive magnetron sputtering, ***Surface and Coatings Technology*****,** 311, 268 (2017).

11. Krishna Kant Pandey, **Aminul Islam**, Shubhendra Shivam Maurya, Bala Praveen Chakkravarthy Raghupathy, MV Sivakumaran, N Kavitha, Anup Kumar Keshri, Hybrid Reinforcement of 1-Dimensional and 2-Dimensional Carbon Nanofillers for Improving the Efficiency of Alumina Membranes, ***Surfaces and Interfaces***, 40, 103084 (2023).

12. Pushpender Singh, **Aminul Islam**, Niranjan Pandit, Satish Indupuri, O. S. A. Rahman, Shailesh Mani Pandey, Anup Kumar Keshri, Plasma sprayed graphene/carbon nanotube reinforced lanthanum-cerate hybrid composite coating, ***Ceramics International***, 49 (7), 11167-11177 (2023).

13. Sudha Kumari, **Aminul Islam**, Kamlesh Kumar Mirche, P. Sai Kiran, Shubhendra Shivam Maurya, Deepak Kumar, Shailesh Mani Pandey, Anup Kumar Keshri, Plasma Sprayed Graphene Reinforced Titanium Nitride Composite Coating: An Effective Solution for Mitigating the Corrosion Attack, ***Surface and Coatings Technology***, 445, 128704 (2022).

14. Rahul Verma, Swati Sharma, Biswajyoti Mukherjee, Pushpender Singh, **Aminul Islam**, Anup Kumar Keshri, Microstructural, mechanical and marine water tribological properties of plasma-sprayed graphene nanoplatelets reinforced Al_2O_3-40 wt% TiO_2 coating, ***Journal of the European Ceramic Society***, 42, 2904 (2022).

15. Kanike Rajesh, Souvik Ghosh, **Aminul Islam**, Manoj Kumar Rangaswamy, Swati Haldar, Partha Roy, Anup Kumar Keshri, Debrupa Lahiri, Multilayered porous hydroxyapatite coating on Ti6Al4V implant with enhanced drug delivery and antimicrobial properties, ***Journal of Drug Delivery Science and Technology***, 70, 103155 (2022).

16. Abhishek Pathak, Biswajyoti Mukherjee, Krishna Kant Pandey, **Aminul Islam**, Pavan Bijalwan, Monojit Dutta, Atanu Banerjee, Anup Kumar Keshri, Process-structure-property relationship for plasma-sprayed iron-based amorphous/crystalline composite coatings, ***International Journal of Minerals, Metallurgy and Materials***, 29, 144 (2022).

17. Dipak Kumar Shukla, Biswajyoti Mukherjee, **Aminul Islam**, Anup Kumar Keshri, Peculiar high temperature tribological behaviour of plasma sprayed graphene nanoplatelets reinforced cerium oxide coatings, ***Ceramics International***, 47, 17809 (2021).

18. Sumit Choudhary, **Aminul Islam**, Biswajyoti Mukherjee, Julia Richter, Tizian Arold, Thomas Niendorf, Anup Kumar Keshri, Plasma Sprayed Lanthanum Zirconate Coating over Additively Manufactured Carbon Nanotube reinforced Ni-based Composite: Unique performance of Thermal Barrier Coating System without Bondcoat, ***Applied Surface Science,*** 550, 149397 (2021).

19. J. U. Bhanu, **Aminul Islam**, P. Thangadurai, Conduction mechanisms responsible for leakage currents in RF sputtered HfO_2 high-κ gate-oxide thin film MOS capacitors, ***Materials Science and Engineering: B,*** 265, 114999 (2021).

20. Swarnima Singh, Krishna Kant Pandey, **Aminul Islam**, Anup Kumar Keshri, Corrosion behaviour of plasma sprayed graphene nanoplatelets reinforced hydroxyapatite composite coatings in simulated body fluid, ***Ceramics International***, 46, 13539 (2020).

21. Krishna Kant Pandey, **Aminul Islam**, Rakesh Kumar, Rahul Ghosh, Venugopal Arjunan, and Anup Kumar Keshri, Role of the Hybrid Addition of Carbon Nanotubes and Graphene Nanoplatelets on the Corrosion Behavior of Plasma-Sprayed Aluminum Oxide Nanocomposite Coating, ***Advanced Engineering Materials*****,** 22, 1900763 (2020).

22. Shreshtha Ranjan, Biswajyoti Mukherjee, **Aminul Islam**, Krishna Kant Pandey, Rohit Gupta, Anup Kumar Keshri, Microstructure, Mechanical and High Temperature Tribological Behaviour of Graphene Nanoplatelets reinforced Plasma Sprayed Titanium Nitride Coating, ***Journal of the European Ceramic Society*****,** 40, 660 (2020).

23. Pavan Bijalwan, Krishna Kant Pandey, Biswajyoti Mukherjee, **Aminul Islam**, Abhishek Pathak, Monojit Dutta, Anup Kumar Keshri**,** Tailoring the Bimodal Zone in Plasma Sprayed

CNT Reinforced YSZ Coating and its Impact on Mechanical and Tribological Properties, ***Surface & Coatings Technology*****,** 377, 124870 (2019).

24. Rakesh Kumar, Krishna Kant Pandey, **Aminul Islam**, Anup Kumar Keshri, Graphene nanoplatelets: A promising corrosion inhibitor and toughening inclusion in plasma sprayed cerium oxide coating, ***Journal of Alloys and Compounds***, 809, 161819 (2019).

25. Atul Ranjan, **Aminul Islam**, Manabendra Pathak, Mohd. Kaleem Khan, **Anup Kumar Keshri**, Plasma sprayed copper coatings for improved surface and mechanical properties, ***Vacuum*****,** 168, 108834 (2019).

26. Biswajyoti Mukherjee, OS Asiq Rahman, **Aminul Islam**, Krishna Kant Pandey, Anup Kumar Keshri, Deposition of multi-scale thickness graphene coating by harnessing extreme heat and rapid quenching: Towards Commercialization, ***ACS Applied Materials and Interfaces*****,** 11, 25500 (2019).

27. Rohit Gupta, **Aminul Islam**, Krishna Kant Pandey, Shreshtha Ranjan, Ravi Kumar Singh, Biswajyoti Mukherjee, Anup Kumar Keshri, In-situ oxide-free titanium nitride coating by conventional plasma spraying with improved properties, ***Ceramics International*****,** 45, 12590 (2019).

28. Biswajyoti Mukherjee, **Aminul Islam**, Krishna Kant Pandey, O.S. Asiq Rahman, Rishow Kumar, Anup Kumar Keshri, Impermeable CeO2 overlay for the protection of plasma sprayed YSZ thermal barrier coating from molten sulfate-vanadate salts, ***Surface and Coating Technology***, 358, 235 (2019).

29. O. S. Asiq Rahman, Biswajyoti Mukherjee, **Aminul Islam**, Anup Kumar Keshri, Instant Tuning of Superhydrophilic to Robust Superhydrophobic and Self Cleaning Metallic Coating: Simple, Direct, One-Step and Scalable Technique, ***ACS Applied Materials and Interface*****,** 11, 4616 (2019).

30. M. Sribalaji, Davinder Singh, Swarnima Singh, **Aminul Islam**, Mayank Kumar Pandey, B. Viswanath, Anup Kumar Keshri, "A New Insight on the Role of 1-D and 2-D Reinforcements in TiC during High Temperature Plastic Deformation", ***Ceramics International***, 44, 18389 (2018).

31. B. Mukherjee, R. Kumar, **Aminul Islam**, O. S. Asiq Rahman, Anup Kumar Keshri, Evaluation of strength-ductility combination by in-situ tensile testing of graphene nano platelets reinforced shroud plasma sprayed Nickel-Aluminium coating, ***Journal of Alloys and Compounds***, 765, 1082 (2018).

32. M. Sribalaji, **Aminul Islam**, Biswajyoti Mukherjee, Mayank Kumar Pandey, Anup Kumar Keshri, Tailoring the thermal shock resistance of titanium carbide by reinforcement with tungsten carbide and carbon nanotubes, ***Ceramics International***, 44, 2552 (2018).

33. Biswajyoti, Mukherjee, Asiq Rahman O.S, **Aminul Islam**, Sribalaji M, Anup Kumar Keshri, Plasma sprayed carbon nanotube and graphene nanoplatelets reinforced alumina hybrid

composite coating with outstanding toughness, ***Journal of Alloys and Compounds***, 727, 658 (2017).

34. M Sribalaji, Biswajyoti Mukherjee, **Aminul Islam**, Anup Kumar Keshri, Microstructural and Mechanical Behavior of Spark Plasma Sintered Titanium Carbide with Hybrid Reinforcement ofTungsten Carbide and Carbon Nanotubes, ***Materials Science and Engineering: A***, 702, 10 (2017).

35. Sharmistha Anwar, **Aminul Islam**, Shahid Anwar, Mechanical studies of thermally annealed nc-W_2N embedded a-Si_3N_4 nanocomposite films, ***Thin Solid Films***, 636, 93 (2017).

36. P. L. Moharana, Shahid Anwar, **Aminul Islam**, Sharmistha Anwar, Structural and Mechanical studies of Tungsten Nitride thin film at elevated temperature, ***Perspectives in Science***, 8, 636 (2016).

Patent Submitted:

1. **Aminul Islam**, Bala Praveen Chakkravarthy Raghupathy, Sivakumaran M V, and Anup Kumar Keshri, A Device for Filtering Water and Method of Fabrication Thereof, **Indian Patent** (Application number: 202241014999 dated 18/03/2022).
2. Anup Kumar Keshri, Pushpender Singh, **Aminul Islam**, Krishna Kant Pandey, Satya Gowtam Dommeti, Plasma Sprayed Carbon Nanotube Reinforced Molybdenum Disulphide Anti-Friction Coating, **Indian Patent** (Application number: 202111042583 dated 20/09/2021).

Peer-reviewed Conference Proceedings:

1. **Aminul Islam**, Sharmistha Anwar, Shahid Anwar, Development of nc-W2N/a-Si3N4 hard coating, *AIP Conference Proceedings*, 1832, 080005 (2017).
2. P. L. Moharana, Shahid Anwar, **Aminul Islam**, S. Bajpai, and Sharmistha Anwar, Study of nickel interlayer thickness effect on WN/Ni multilayer thin film, *AIP Conference Proceedings*, 1832, 080023 (2017).

Conference Presented:

1. Biswajyoti Mukherjee, Rishow Singh, **Aminul Islam**, Anup Kumar Keshri, Graphene Nanoplatelets Reinforced Plasma Sprayed Alumina-Titania Coating with Improved Corrosion and Wear Resistance., ***CIMTEC 2018***, Perugia, Italy, 04-08, (2018).
2. **Aminul Islam**, Biswajyoti Mukherjee, O. S. Asiq Rahman, Anup Kumar Keshri, "In-situ tensile testing of graphene nano platelets reinforced shroud plasma sprayed Nickel-Aluminium coating" ***Indian Institute of Metals (NMD-ATM)***, Kolkata, November 14-16 (2018).
3. M. Sribalaji, Biswajyoti Mukherjee, **Aminul Islam**, Tapas Laha, Anup Kumar Keshri, "Synergistic Reinforcement of Tungsten Carbide and Carbon Nanotubes for Improving the Fracture Toughness of Titanium Carbide based Ultra High Temperature Ceramic", ***28th***

International Conference on Diamond and Carbon Related Materials, Gothenburg, Sweden, September 03-07 (2017).

4. **Aminul Islam**, Shahid Anwar, Sharmistha Anwar, "Effect of deposition time on nc- W_2N/a-Si_3N_4 nanocomposite thin film deposited by Reactive Magnetron Sputtering" in international conference on recent trends in Engineering and Material Sciences (ICEMS- 2016) held at Jaipur, ***National University, Jaipur***, India, during March 17-19 (2016).
5. **Aminul Islam**, Shahid Anwar, Sharmistha Anwar, "Fabrication and characterization of hard nanocomposite and multilayers coatings" in Advanced coating technology: opportunity for Indian industries (WACT-2016) held at ***CSIR-IMMT, Bhubaneswar***, India, February 25-26 (2016).

Drafted Project Proposal for funding under advice of Prof. Anup K Keshri:

1. Development of High-Temperature Wear and Corrosion Resistant Graphene Nanoplatelates Reinforced Plasma Sprayed Cr_3C_2-NiCr composite Coating for thermal power plant, funded by CPRI, Govt. of India **(Accepted)**.

2. Graphene Based Membrane for Water Desalination with Improved Properties, funded by DST, Govt. of India **(Accepted)**.

List of References:

Name	**Prof. Anup Kumar Keshri**	**Prof. Anirban Chowdhury**	**Prof. P. Thangadurai**
Relation	PhD Supervisor at IIT Patna, India	Project Co-Supervisor at IIT Patna, India	M.Tech Thesis advisor Pondicherry University, India
Email	anup@iitp.ac.in	anirc@iitp.ac.in	thangaduraip.nst@pondiuni.edu.in

Declaration:

I hereby declare that the above-mentioned information is correct up to my knowledge and I bear the responsibility for the correctness of the above-mentioned particulars.

Date: March - 2024 ***Dr. Aminul Islam***

Place: Guwahati, India **Signature**

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