

Ahin Roy

Curriculum Vitae

Materials Science Centre, Indian Institute of Technology, Kharagpur
Kharagpur, West Bengal, India- 721302

+91-7348903906

+91-3222-283988

✉ ahinroy@matsc.iitkgp.ac.in

📄 Research Webpage

Experience

- Jan 2022 – **Assistant Professor**, Materials Science Centre, IIT-Kharagpur, India.
present Research area: synthesis, simulation and atomic-scale electron microscopy of nanomaterials
- Aug 2019 – **Research Fellow**, Advanced Microscopy Laboratory, Trinity College Dublin, Ireland.
Oct 2021 Worked on atomic-scale electron microscopy of nanomaterials for energy applications
- Nov 2017 – **Research Associate**, Indian Institute of Science, Bangalore, India.
Jul 2019 Worked on computation, synthesis and electron microscopy of functional nanomaterials
- Sep 2015– **JSPS Postdoctoral Fellow**, Kyushu University, Fukuoka, Japan.
Sep 2017 Worked on functional nanomaterials using aberration-corrected transmission electron microscopy
- Aug 2011– **Integrated Ph. D Research Fellow**, Materials Research Centre, Indian Institute of Science, Bangalore, India.
Aug 2015 Worked on synthesis, characterization and simulations of metal nanowires

Ph. D Thesis

Title Investigations of Structural and Electronic Aspects of Ultrathin Metal Nanowires

Awards

- 2017 Best Poster Award, International Conference and Annual Meeting of Electron Microscope Society of India, Mahabalipuram, Chennai
- 2015 Young Scientist Award in Physics, Dr. K. V. Rao Scientific Society, Hyderabad
- 2015 JSPS Postdoctoral Fellowship, MEXT Japan (2015-2017)
- 2014 Gold Award, Shell India Computational Talent Prize
- 2012 Unilever-RSC Science Communication Scholarship, Imperial College, London
- 2009 Integrated Ph. D fellowship, Indian Institute of Science, Bangalore (2009-2016)
- 2002 Certificate of distinction, International Australian Mathematics Olympiad

Education

- 2009–2011 **Masters of Science**, Indian Institute of Science, Bangalore.
First Class
- 2006–2009 **Bachelor of Science**, Ramakrishna Mission Residential College, Narendrapur, University of Calcutta.
First Class Honours in Chemistry

Skills and Expertise

- Electron Microscopy Proficient in working with FEI T20 and F30 TEMs for regular imaging, FEI TITAN Themis, JEOL-ARM, and Nion UltraSTEM200 for atomic-scale STEM and associated energy dispersive X-ray spectroscopy (EDS) and electron energy loss spectroscopy (EELS).
- Simulation Density Functional Theory (DFT) based simulation of functional nanomaterials - VASP and SIESTA codes: proficient in installation on parallel architecture clusters, execution and analysis.
- Synthesis Wet-chemistry using hydrothermal and microwave methods, characterization using XRD, UV-vis spectroscopy, and electrochemistry using cyclic voltammetry.

Projects & Funding

- 2022–2024 Atomic-scale Structural and Electronic Interrogation of Symmetry-broken Noble Metal Nanostructures for Oxygen Reduction; PI, SERB Startup Research Grant (SRG), India
- 2019–2021 Engineering photoluminescence of Tungsten Sulfide through Doping and Electrical Biasing; Co-PI, DST-JSPS Bilateral Research Funding, India & Japan
- 2015–2017 Three-dimensional nanoanalyses of catalytic nanocomposite by electron tomography; Fellow, JSPS Standard Postdoc Program, Japan

Publications

- [39] S. Kuila, Harshit, N. Roy, S. Ghanta, R. Pan, K. Buxi, P. Pramanik, A. K. Bera, B. Saha, S. Yusuf, V. Petricek, A. Roy, P. P. Jana; Ni₃InSb: Synthesis, Crystal Structure, Electronic Structure and Magnetic Properties; *Inorganic Chemistry (in press)*
- [38] L. Hughes,*[‡] A. Roy,*[‡] C. Downing, M. P. Browne, A. Zhussupbekova, I. Shvets and V. Nicolosi;* Surface Reduced Manganese States as a Source of Oxygen Reduction Activity in BaMnO₃; *Advanced Functional Materials*, 2214883 (2023)
- [37] S. Pinilla, S. Ryan, L. McKeon, M. Lian, S. Vaesen, A. Roy, J. N. Coleman, and V. Nicolosi; Additive manufacturing of Li-ion batteries: A comparative study between electrode fabrication processes; *Advanced Energy Materials*, 2203747 (2023)
- [36] D. Tyndall, M. Craig, L. Gannon, C. McGuinness, N. McEvoy, A. Roy, M. García-Melchor, M. P. Browne and V. Nicolosi; Demonstrating the Source of Inherent Instability in NiFe LDH Based OER Electrocatalysts; *Journal of Materials Chemistry A*, 11, 4067-4077 (2023)
- [35] O. Ronan,* A. Roy,* S. Ryan, L. Hughes, C. Downing, L. Jones and V. Nicolosi;* Templated synthesis of SiO₂ nanotubes for lithium-ion battery applications: an in-situ (Scanning) Transmission Electron Microscopy study; *ACS Omega*, 8, 1, 925-933 (2023)
- [34] H. Kaur, B. Konkena, C. Gabbett, R. Smith, M. McCrystall, R. Tian, A. Roy, T. Carey, V. Vega-Mayoral, V. Nicolosi, J. N. Coleman; Amorphous 2D-Nanoplatelets

- of Red Phosphorus Obtained by Liquid-Phase Exfoliation Yield High Areal Capacity Na-Ion Battery Anodes; [Advanced Energy Materials](#), 2203013 (2022)
- [33] A. Garcia-Gil, S. Biswas, D. McNulty, [A. Roy](#), K. M. Ryan, V. Nicolosi and J. D. Holmes; High aspect-ratio Germanium-Tin Alloy Nanowires: Potential as Highly Efficient Li-Ion Battery Anodes; [Advanced Materials Interfaces](#), 2201170 (2022)
- [32] B. Konkena, H. Kaur, R. Tian, C. Gabbett, M. McCrystall, D. Horváth, K. Synnatschke, [A. Roy](#), R. Smith, V. Nicolosi, M. D. Scanlon and J. N. Coleman; Liquid Processing of Interfacially Grown Iron-Oxide Flowers into 2D-Platelets Yields Lithium-Ion Battery Anodes with Capacities of Twice the Theoretical Value; [Small](#), 18, 2203918 (2022)
- [31] T. Chen, H. Kaur, M. McCrystall, R. Tian, [A. Roy](#), R. Smith, D. Horváth, J. Maughan, B. Konkena, M. Venkatesan, K. Synnatschke, T. Carey, J. Lui, J. Pepper, R. Zhang, C., V. Nicolosi, H. Xia and J. Coleman; Liquid Phase Exfoliation of Nonlayered Non-Van Der Waals Iron Trifluoride (FeF_3) into 2D-Platelets for High-Capacity Lithium Storing Cathodes; [FlatChem](#), 33, 100360 (2022)
- [30] A. Garcia-Gil, S. Biswas, [A. Roy](#), D. Saladukh, S. Raha, T. Blon, M. Conroy, V. Nicolosi, A. Singha, L. M. Lacroix and J. D. Holmes; Growth and analysis of the tetragonal (ST12) germanium nanowires; [Nanoscale](#), 14, 2030-2040 (2022)
- [29] A. Garcia, S. Biswas, D. McNulty, [A. Roy](#), S. Raha, S. Trabesinger, V. Nicolosi, A. Singha and J. D. Holmes; One-step Grown Carbonaceous Germanium Nanowires and their Application as Highly-efficient Lithium-ion Battery Anodes; [ACS Applied Energy Materials](#), 5, 1922-1932 (2022)
- [28] E. Piatti, A. Arbab, F. Galanti, T. Carey, L. Anzi, D. Spurling, [A. Roy](#), A. Zhussupbekova, K. A. Patel, J. M. Kim, D. Daghero, R. Sordan, V. Nicolosi, R. S. Gonnelli, F. Torrisi; Charge transport mechanisms in inkjet-printed thin-film transistors based on two-dimensional materials; [Nature Electronics](#), 4, 893-905 (2021)
- [27] D. Samantaray, M. Gayen, [A. Roy](#), B. Pavithra, N. Ravishankar; Mechanistic understanding of formation of ultrathin single crystalline Pt nanowires; [Journal of Physical Chemistry C](#), 125, 27458-27464 (2021)
- [26] H. Kaur, R. Tian, [A. Roy](#), M. McCrystall, R. Smith, V. Nicolosi, J. Coleman; 2D Nanosheets from Fool's gold by LPE: High performance lithium-ion battery anodes made from stone; [FlatChem](#), 30, 102995 (2021)
- [25] D. Tyndall, S. Jaskaniec, B. Shortall, [A. Roy](#), L. Gannon, K. O'Neill, M. P. Browne, J. Coelho, C. McGuinness, G. S. Duesberg and V. Nicolosi; Post-Synthetic Treatment of Nickel-Iron Layered Double Hydroxides for Optimum Catalysis of the Oxygen Evolution Reaction; [npj 2D Materials and Applications](#), 5, Article number: 73 (2021)
- [24] P. Thakur, K. Alam, [A. Roy](#), C. Downing, V. Nicolosi, P. Sen, T. N. Narayanan; Extending the Cyclability of Alkaline Zinc-Air Batteries: Synergistic Roles of Li^+ and K^+ Ions in Electrode; [ACS Applied Materials & Interfaces](#), 13, 33112-33122 (2021)

- [23] S. Ippolito, A. G. Kelly, R. F. de Oliveira, M. A. Stoeckel, D. Iglesias, [A. Roy](#), C. Downing, Z. Bian, L. Lombardi, Y. A. Samad, V. Nicolosi, A. C. Ferrari, J. N. Coleman, P. Samori; Covalently interconnected transition metal dichalcogenide networks via defect engineering for high-performance electronic devices; [Nature Nanotechnology](#), **16**, 592–598 (2021)
- [22] H. Kaur, R. Tian, [A. Roy](#), M. McCrystall, D. Horváth, M. Ruether, A. Griffin, C. Backes, V. Nicolosi, J. Coleman; Production of quasi-2D platelets of non-layered iron pyrite (FeS₂) by liquid-phase exfoliation and their use in high performance battery anodes; [ACS Nano](#), **14**, 13418-13432 (2020)
- [21] G. Prakash, S. Kundu, [A. Roy](#), A. K. Singh, N. Ravishankar and A. K. Sood; Carrier Dynamics in Ultrathin Gold Nanowires: Role of Auger Processes; [Plasmonics](#), **15**, 1151–1158 (2020)
- [20] T. Ahmed, P. Bellare, R. Debnath, [A. Roy](#), N Ravishankar and A. Ghosh; Thermal history dependent current relaxation in hBN/MoS₂ van der Waals dimers; [ACS Nano](#), **14**, 5909-5916 (2020)
- [19] P. Kumar, K. Thakar, N. Verma, J. Biswas, T. Maeda, [A. Roy](#), K. Kaneko, C. Nandi, S. Lodha, B. Viswanath; Polymorphic in-plane heterostructure of WS₂ for light-triggered FET device applications; [ACS Applied Nano Materials](#), **3**, 3750-3759 (2020)
- [18] L. Sharma, R. Gond, B. Senthilkumar, [A. Roy](#), P. Barpanda; Fluorophosphates as Efficient Bifunctional Electrocatalysts for Metal-air Batteries; [ACS Catalysis](#), **10**, 43-50 (2020)
- [17] N. Jain, [A. Roy](#); Phase & Morphology Engineered Surface Reducibility of MnO₂ Nano-heterostructures: Implications on Catalytic Activity towards CO Oxidation; [Materials Research Bulletin](#), **121**, 110615 (2020)
- [16] N. Jain, [A. Roy](#), A. De; Ba-addition Induced Enhanced Surface Reducibility of SrTiO₃: Implication on Catalytic Aspects; [Nanoscale Advances](#), **1**, 4938-4946 (2019)
- [15] N. Jain, [A. Roy](#), S. Nair; Reduced SrTiO₃-Supported PtCu Alloy Nanoparticles for Preferential Oxidation of CO in Excess Hydrogen; [Nanoscale](#), **11**, 22423-22431 (2019)
- [14] R. K. Rai, S. Islam, [A. Roy](#), G. Agrawal, A. K. Singh, A. Ghosh and N Ravishankar; Morphology Controlled Synthesis of Low Bandgap SnSe₂ with High Photodetectivity; [Nanoscale](#), **11**, 870-877 (2019)
- [13] P. Kumar, D. Chatterjee, T. Maeda, [A. Roy](#), K. Kaneko and B. Viswanath; Scalable faceted voids with luminescence enhanced edges in WS₂ monolayers; [Nanoscale](#), **10**, 16321-16331 (2018)
- [12] S. Tripathi, [A. Roy](#), S. Nair, S. Durani, and R. Bose; Removal of U(VI) from aqueous solution by adsorption onto synthesized silica and zinc silicate nanotubes: Equilibrium

- and kinetic aspects with application to real samples; [Environmental Nanotechnology, Monitoring & Management](#), **10**, 127-139 (2018)
- [11] K. Ghosh,[‡] [A. Roy](#),[‡] S. Tripathi, S. Ghule, A. K. Singh and N. Ravishankar; Insights on Nucleation and Growth of Different Phases of WO₃: Morphology Control and Electrochromic Property; [Journal of Materials Chemistry C](#), **5**, 7307-7316 (2017)
- [10] A. Pradhan, [A. Roy](#), S. Tripathi, A. Som, D. Sarkar, J. K. Mishra, K. Roy, T. Pradeep, N. Ravishankar and A. Ghosh; Ultra-high Sensivity Infra-red Detection and Temperature Effects in Graphene-Tellurium Nanowire Binary Hybrid; [Nanoscale](#), **9**, 9284-9290 (2017)
- [9] A. Manjanath,[‡] [A. Roy](#),[‡] A. Samanta and A. K. Singh; Negative Differential Resistance in Armchair Silicene Nanoribbons; [IOP Nanotechnology](#), **28**, 275402 (2017)
- [8] T. Maeda, K. Kaneko, K. Yamada, [A. Roy](#), Y. Sato, R. Teranishi, T. Kato, T. Izumi, and Y. Shiohara; Nanostructural characterization of artificial pinning centers in PLD-processed REBa₂Cu₃O_{7-δ} films; [Ultramicroscopy](#), **176**, 151-160 (2017)
- [7] [A. Roy](#),[‡] K. R. Amin,[‡] S. Tripathi, S. Biswas, A. K. Singh, A. Bid, and N. Ravishankar; Manipulation of Optoelectronic Properties and Band Structure Engineering of Ultrathin Te Nanowires by Chemical Adsorption; [ACS Applied Materials and Interfaces](#), **9**, 19462-19469 (2017)
- [6] K. R. Amin, S. Kundu, S. Biswas, [A. Roy](#), A. K. Singh, and N. Ravishankar; Effect of Ambient on Electrical Transport Properties of Ultrathin Au Nanowires; [Applied Physics Letters](#), **109**, 253108 (2016)
- [5] [A. Roy](#), S. Tripathi, Y. Sato, and K. Kaneko; Transmission Electron Microscopic Analysis of One-dimensional Metal Nanowire: The Case of Tellurium and Gold; [Materia Japan](#), **55** (12), 603 (2016)
- [4] S. Tripathi, [A. Roy](#), R. Bose, S. Nair, and N. Ravishankar; Synthesis of Hollow Nanotubes of Zn₂SiO₄ or SiO₂: Mechanistic Understanding and Uranium Adsorption Behaviour; [ACS Applied Materials and Interfaces](#), **7** (48), 26430–26436 (2015)
- [3] [A. Roy](#), S. Kundu, K. Müller, A. Rosenauer, S. Singh, P. Pant, M. P. Gururajan, P. Kumar, J. Weissmüller, A. K. Singh, and N. Ravishankar; Wrinkling of Atomic Planes in Ultrathin Gold Nanowires; [Nano Letters](#), **14**, 4859-4866 (2014)
- [2] [A. Roy](#), T. Pandey, N. Ravishankar, and A. K. Singh; Semiconductor-like Sensitivity in Metallic Ultrathin Gold Nanowire based Sensors; [Journal of Physical Chemistry C](#), **118**, 676- 682 (2014)
- [1] [A. Roy](#), T. Pandey, N. Ravishankar, and A. K. Singh; Single Crystalline Ultrathin Gold Nanowires: Promising Nanoscale Interconnects; [AIP Advances](#) **3**, 032131 (2013)

[‡] denotes equal contribution

* denotes corresponding author

Conference Proceedings

- 2022 L. Hughes, [A. Roy](#), C. Downing, M. P. Browne, A. Zhussupbekova, V. Nicolosi; The Advanced Characterization and Structure-Property Correlation of BaMnO₃ for the Oxygen Reduction Reaction Using Electron Microscopy; [Microscopy and Microanalysis 28 \(S1\), 2586-2588](#)
- 2022 T. Simonian, [A. Roy](#), Z. Sofer, V. Nicolosi; Characterisation of Planar Defects in Ternary Layered Chalcogenides for Electronic Devices; [Microscopy and Microanalysis 28 \(S1\), 2392-2393](#)
- 2021 T. Simonian, [A. Roy](#), V. Nicolosi, Z. Sofer; Characterisation and Defect Analysis of 2D Layered Ternary Chalcogenides; [Microscopy and Microanalysis 27 \(S1\), 642-643](#)
- 2020 D. Samantaray, S. Shetty, S. Mondal, [A. Roy](#), D. Chatterjee, P. Bellare, N Ravishankar; Mechanistic Studies of Growth of Ultrathin Pt and Alloy Nanowires; [Microscopy and Microanalysis 26 \(S2\), 2400-2401](#)
- 2020 R. K. Rai, S. Islam, [A. Roy](#), G. Agrawal, A. Ghosh, N Ravishankar; Morphology Controlled Low-dimensional Single-crystalline SnSe₂-Graphene Hybrid for near IR Photodetection; [Microscopy and Microanalysis 26 \(S2\), 2338-2340](#)
- 2018 A. Pradhan, [A. Roy](#), S. Tripathi, D. Sarkar, J. K. Mishra, K. Roy, T. Pradeep, N Ravishankar, A. Ghosh; Temperature Dependent Infra-red Detection in Graphene-Tellurium Nanowire Binary Hybrid with Ultra-high Sensitivity; [APS March Meeting 2018, abstract id.T60.175](#)
- 2017 S. Tripathi, K. Ghosh, [A. Roy](#), A. K. Singh, N Ravishankar; Wet-chemical Synthesis of Electrochromic WO₃ and W_xMo_{1-x}O₃ Nanomaterials with Phase and Morphology Control; [Microscopy and Microanalysis 23 \(S1\), 1876-1877](#)
- 2017 S. Tripathi, [A. Roy](#), N Ravishankar; Ambient Dependent Formation of Zn₂SiO₄ and SiO₂ from Core-shell ZnO@SiO₂; [Microscopy and Microanalysis 23 \(S1\), 1758-1759](#)
- 2017 S. Tripathi, K. Ghosh, [A. Roy](#), A. K. Singh, N Ravishankar; Electrochromic tungsten molybdenum oxide: synthesis with phase and morphology control; [Acta Crystallographica A- Foundation and Advances 73, C1223](#)
- 2016 [A. Roy](#), K. Müller, K. Kaneko, A. Rosenauer, J. Weismüller, A. K. Singh, N Ravishankar; Atomic relaxation in ultrathin FCC metal nanowires; [European Microscopy Congress 2016: Proceedings, 423-424](#)

Outreach Experience

- 2017 **Microscopy at the Ultimate Limit: 'See'-ing the Atoms in Materials**, Invited talk at Meizen High School, Kurume, Fukuoka, Japan (JSPS Science Dialogue Program)

Invited Talks

- Oct 2022 Interrogation of Materials with a Transmission Electron Microscope: from Micro/nano-structure to Atomic-scale; [Analytical Advances in Studying Molecules, DST-STUTI Workshop, BITS Pilani, Rajasthan, India](#)

- Aug 2021 Synergistic Atomic-scale Electron Microscopy and Atomistic Simulations for Metal Nanowires; [Future of Chemistry Symposium, Tata Institute of Fundamental Research, Mumbai, India](#)
- Jun 2019 Combinatorial Interrogation of Functional Nanomaterials through Electron Microscopy and DFT Simulations; [EMAAT International Conference, Shimla, Himachal Pradesh, India](#)
- Oct 2018 Synergistic Atomistic Simulations and Designed Experiments for Functional Nanomaterials; [IIT Mandi, Himachal Pradesh, India.](#)
- Aug 2018 Functional Materials Approaching Molecular Scale: Insights from Electron Microscopy, Simulations & Designed Experiments; [TIFR-TCIS Hyderabad, India](#)
- July 2017 Functional Low dimensional Materials: Insights from Atomistic Simulations and Designed Experiments; [Department of Metallurgical and Materials Engineering, IIT Madras, India](#)
- July 2017 Functional Low dimensional Materials: from Ab Initio Simulations and Experiments; [CGCRI, Kolkata, India](#)
- July 2017 Designed Experiments on Functional Low dimensional Materials from Ab Initio Simulations; [S. N. Bose National Centre for Basic Sciences, Kolkata, India](#)
- July 2017 Functional Low dimensional Materials from Atomistic Simulations and Targeted Experiments; [Department of Chemistry, IIT Guwahati, India](#)

Contributed Talks

- 2020 Phase and Morphology Dependent Ion-intercalation in Electrochromic WO_3 ; [Microscopy Society of Ireland Symposium, Trinity College Dublin, Ireland](#)
- 2018 3-D Atomic Structure of Ultrathin Metal Nanowires: the Cases of Au and Pt; [Annual Meeting of Electron Microscope Society of India, Bhubaneswar, India](#)
- 2017 Adsorption Induced Band Structure Engineering of Te Nanowires; [Annual Meeting of Electron Microscope Society of India, Mahabalipuram, India](#)
- 2016 NO_2 Adsorption Induced Semiconductor to Metal Transition in Ultrathin Te Nanowires; [ICTAM-AMF-10, Delhi, India](#)
- 2016 Atomic Relaxation in Ultrathin FCC metal Nanowires; [European Microscopy Congress, Lyon, France](#)
- 2015 Intriguing Atomic Structure and Semiconductor Nanowire Equivalent Sensitivity of Ultrathin Gold Nanowires; [Japan Society of Microscopy Regional Meeting, Kyushu University, Japan](#)
- 2014 Semiconductor-like Sensitivity Using Ultrathin Au Nanowire Sensors; [Materials Research Society, Fall- 2014, Boston, Massachusetts, USA](#)

Professional Membership

Life member Electron Microscope Society of India (EMSI)

Community Service

Reviewer J. Mat. Sci., ACS Sustain. Chem. Eng., npj 2D Mater. Appl.