

Ahin Roy

Curriculum Vitae

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🌐 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

Masters Thesis

Title Synthesis of ZnO-based Hybrid Nanostructures for Photovoltaic Applications

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). Experienced in regular maintenance (baking and conditioning) of JEOL-ARM machines. Extensive experience from user training to project conception and execution based on AC-STEM and complementary strengths.
- 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

- 2019–2021 Engineering photoluminescence of Tungsten Sulfide through Doping and Electrical Biasing; [Co-PI, DST-JSPS Bilateral Research Funding](#)
- 2015 Three-dimensional nanoanalyses of catalytic nanocomposite by electron tomography; [Fellow, JSPS Standard Postdoc Program](#)

Publications

- [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 \(in press\)](#)
- [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 (FeS_2) 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 Zn_2SiO_4 or SiO_2 : 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

Conference Proceedings

- 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 SnSe_2 -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 WO_3 and $\text{W}_x\text{Mo}_{1-x}\text{O}_3$ Nanomaterials with Phase and Morphology Control; [Microscopy and Microanalysis](#) **23** (S1), 1876–1877
- 2017 S. Tripathi, [A. Roy](#), N Ravishankar; Ambient Dependent Formation of Zn_2SiO_4 and SiO_2 from Core-shell $\text{ZnO}@\text{SiO}_2$; [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. Weissmüller, 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

- 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 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](#)

Student mentoring

- 2019-'21 Ms. Lucia Hughes, Mr. Tigran Simonian; **Ph. D student, Trinity College Dublin**
2018-'19 Dr. Noopur Jain: 3 first-author journal papers; **Ph.D student, IISc Bangalore**
2018-'19 Ms. Angana De: 1 co-authored journal paper; **BS student, IISc Bangalore**
2014-'15 Mr. Kanad Ghosh: 1 first-author journal paper; **BS student, IISc Bangalore**

Professional Membership

Life member Electron Microscope Society of India (EMSI)

Community Service

Reviewer J. Mat. Sci., ACS Sustain. Chem. Eng., NPJ 2D Mater. Appl.
Topic Editor MDPI Materials

Languages

Bengali **Mothertongue**
English **Expert**
Hindi **Intermediate**

Proficient in reading, writing and speaking
Conversationally fluent