Ahin Roy

Curriculum Vitae

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

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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
- Aug 2015 of Science, Bangalore, India.

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 Proficient in working with FEI T20 and F30 TEMs for regular imaging, FEI TI-Microscopy TAN 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.

Simulation Density Functional Theory (DFT) based simulation of functional nanomaterials - VASP and SIESTA codes: expert in installation, 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-Pl, DST-JSPS Bilateral Research Funding

2015 Three-dimensional nanoanalyses of catalytic nanocomposite by electron tomography; Fellow, JSPS Standard Postdoc Program

Publications

[29] A. Garcia-Gil, 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, accepted (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)

- 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 Electrodics; 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/MoS $_2$ 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 $SrTiO_3$: 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)

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
- 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 WO $_3$ and W $_x$ Mo $_{1-x}$ 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 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

- 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

[†] denotes equal contribution

- 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 WO₃; 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 NO₂ 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