Ahin Roy

Curriculum Vitae

CRANN, Trinity College Dublin
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Research Webpage

Experience

Aug 2019 – present **Research Fellow**, Advanced Microscopy Laboratory, Trinity College Dublin, Ireland.
Working on high-end electron microscopy of nanomaterials

Nov 2017 – Jul 2019 **Research Associate**, Indian Institute of Science, Bangalore, India.
Worked on computation, synthesis and electron microscopy of functional nanomaterials

Sep 2015– Sep 2017 **JSPS Postdoctoral Fellow**, Kyushu University, Fukuoka, Japan.
Worked on functional nanomaterials using aberration-corrected transmission electron microscopy

Aug 2011– Aug 2015 **Integrated Ph. D Research Fellow**, Materials Research Centre, Indian Institute 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

Supervisors Prof. N Ravishankar & Prof. Abhishek Kumar Singh

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

Supervisors Prof. N Ravishankar

2006–2009 **Bachelor of Science**, Ramakrishna Mission Residential College, Narendrapur, University of Calcutta.
First Class Honours in Chemistry

Skills and Expertise

Electron Microscopy: Have worked with FEI T20 and F30 TEMs for regular imaging, FEI TITAN Themis, JEOL-ARM, and **Nion** for atomic-scale and low-kV STEM. Proficient in regular maintenance (baking and conditioning) of JEOL-ARM.

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-PI, 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; Carbonaceous Germanium Nanowires and their Application as Highly-efficient Lithium-ion Battery Anodes; (under review)

[28] D. Samantaray, M. Gayen, A. Roy, B. Pavithra, N. Ravishankar; Mechanistic understanding of formation of ultrathin single crystalline Pt nanowires; (under review)

[27] 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; Gate-tunable, temperature-dependent charge transport in inkjet-printed thin-film transistors of two-dimensional materials; (under review)

[26] H. Kaur, R. Tian, A. Roy, M. McCrystall, R.Smith, V. Nicolosi, J. Coleman; Quasi-2D FeS_2 flakes from Fool's gold: High performance lithium-ion battery anodes made from stone; (under review)

[26] 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, accepted (2021)

[24] 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, accepted (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/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 WS_2 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 MnO_2 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 $SrTiO_3$-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 $SnSe_2$ 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 WS_2 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 WO_3: 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 $REBa_2Cu_3O_{7-\delta}$ 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

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 $W_xMo_{1-x}O_3$ Nanomaterials with Phase and Morphology Control; Microscopy and Microanalysis 23 (S1), 1876-1877

2017 S. Tripathi, A. Roy, N Ravishankar; Ambient Dependent Formation of Zn_2SiO_4 and SiO_2 from Core-shell ZnO@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. 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

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–till date Ms. Lucia Hughes, Mr. Tigran Simonian & Mr. Mario Villa Navas; 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** *Proficient in reading, writing and speaking*

Hindi **Intermediate** *Conversationally fluent*

References

Prof. Valeria Nicolosi
Professor,
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Prof. Kenji Kaneko
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