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Editorial

Nano Letters Seed Grants, Take Two

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Two years ago, *Nano Letters* piloted an initiative to engage young scientists globally and to highlight their creative ideas in nanoscience and nanotechnology. We hosted an international competition open to later-stage graduate students to submit high-impact proposal ideas that could be carried out in around a year. These proposals were evaluated according to four geographic regions, and each proposal was reviewed by two Associate Editors. In consultation with the Editor-in-Chief, the winners were then selected. Each winner received 2,500 USD to perform their proposed work. Highlights of the winners and finalists, as well as topics of their proposals, can be found in a series of Viewpoints.[1−4]

Building on the success of the pilot project, *Nano Letters* was excited to host this global student competition for a second round this year, where we received 120 submissions. In this Editorial, we are pleased to share with you the winners and their projects. For each region, we also highlight four worthy finalists who also wrote outstanding original proposals.

REGION 1: EAST ASIA AND THE PACIFIC

Wei Zheng, University of Adelaide, Australia (supervisors: Zaiping Guo and Gemeng Liang), is the *Nano Letters* Seed Grant awardee from East Asia. Wei proposes to improve the stability and reaction kinetics of layered oxides as cathode materials for sodium-ion batteries. She will focus on:[1] high-entropy material design of the oxide layers to eliminate structural instability;[2] nanoscale morphology and layer edge facets to enhance the reaction kinetics; and[3] atomic-level and in situ characterization to build the structure−property−performance relationships.

In alphabetical order of last name, the finalists from East Asia and the Pacific are:

Wei Ying Lieu, Singapore University of Technology and Design, Singapore (supervisors: Hui Ying Yang and Zhi Wei Seh). Her proposal focuses on rechargeable aluminum batteries that have potential advantages over lithium batteries. Wei Ying aims to leverage the flexible chemistry of MXenes to explore and design the internal processes and reactions between the electrolytes and electrodes.

Hohyung Kang, Korea Advanced Institute of Science and Technology, South Korea (supervisor: Hee-Tae Jung). His proposal focuses on developing humidity and temperature resistant gas sensors. A key feature is to apply artificial intelligence (AI)-based signal processing to correct for temperature and humidity induced changes in the sensor output.

Tianruo Shen, Singapore University of Technology and Design, Singapore (supervisor: Xiaogang Liu). His proposal aims to use tetrazine-based fluorogenic labels to create high-brightness fluorophores at near-infrared wavelengths. Tianruo aims to control the intramolecular rotation between the donor and acceptor molecules to reconfigure intramolecular charge transfer processes that traditionally constrain the operational wavelengths.

Yubin Wang, Tsinghua University, China (supervisor: Qihua Xiong). His proposal seeks to create exciton polaritons from single quantum emitters, which are a building block for quantum photonic circuits. He aims to integrate strain-engineered quantum emitters in monolayer transition metal dichalcogenide into optical cavities.

REGION 2: EUROPE

Jianhui Zhang, University College of London (supervisor: Tiwari K. Manish), is the *Nano Letters* Seed Grant awardee from Europe. Jianhui will develop deep learning algorithms to discover surface coatings based on covalent organic frameworks (COFs) and metal organic frameworks (MOFs) with optimized icephobic performance. His work aims to advance the use of AI in the design of large-scale heterogeneous surfaces.

In alphabetical order of last name, the finalists from Europe are:

Marc Botifoll, Catalan Institute of Nanoscience and Nanotechnology (ICN2), Spain (supervisor: Jordi Arbiol). Marc will develop a machine learning platform for rapid data interpretation in bandgap mapping of semiconductor heterostructures using low-loss electron energy loss spectroscopy (EELS). His work will provide an automated approach for advanced characterization of complex nanodevices.

Elkin Escobar Chaves, Groningen University, The Netherlands (supervisor: Romana Schirhagl). Elkin will test fluorescent nanodiamonds as biosensors for diamond-based quantum sensing of free-radical-mediated oxidative stress in liver cells and tissues. His work will provide insight into the significance of oxidative stress monitoring in the early diagnosis of nonalcoholic fatty liver disease.

Simone Melesi, Politecnico di Milano, Italy (supervisor: Carlo Spartaco Casari). Simone aims to develop an electrospinning-based method to fabricate carbon atomic wires

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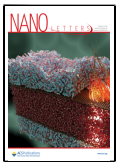

embedded in polymeric nanofibers with precisely controlled alignment and distribution. Multiple nanoscale spectroscopic techniques will be applied to characterize the nanocomposite.

Han Zhao, University of Zurich, Switzerland (supervisor: Greta Patzke). Han proposes to use strain engineering on carbon nanotube supports to facilitate carbon−nitrogen bond formation in organonitrogen compound syntheses. His work can provide insight into the role of strain on catalytic coupling reactions that are important in chemical manufacturing.

REGION 3: SOUTH ASIA, THE MIDDLE EAST, AND AFRICA

Gunjan Sharma, Tata Institute of Fundamental Research, Mumbai, India (supervisor: Vivek Polshettiwar), is the *Nano Letters* Seed Grant awardee from South Asia, the Middle East, and Africa. Gunjan proposes a high-efficiency method to produce ammonia, of which up to 90% of industrially synthesized ammonia goes toward fertilizer needed to feed the global population. However, industrial methods for ammonia synthesis require high temperatures and pressures. His proposal will develop a more sustainable, green method for ammonia production using hot electrons from black gold. Black gold is a strong solar absorber, and low-power illumination of this material could enable room-temperature and atmospheric pressure ammonia synthesis.

In alphabetical order of last name, the finalists are:

Patricia Ekpo, University of Uyo, Nigeria (supervisor: Atim Sunday Johnson). Patricia proposes a cost-effective method to produce palladium, iron, and silver nanoparticles for use in antimicrobial and larvicidal treatments. The metal nanoparticles will be made using the peel extracts of eggplants and plantains, which provide more cost-effective and abundant reducing agents and stabilizers. These nanoparticles will be evaluated for their antimicrobial and larvicidal potential.

Nedim Haciosmanoğlu, Bilkent University - National Nanotechnology Research Center (UNAM), Turkey (supervisor: Fatih Inci). Nedim proposes to develop a fluorescence microscopy approach to detect microplastics with high sensitivity using off the shelf optical disks (DVDs). Given the ubiquity of microplastics, mitigating that pollution requires rapid and low-cost methods to identify and quantify them in the field. Nedim's approach could enable more effective and continuous environmental monitoring.

Jitendra Kumar, ICAR, National Dairy Institute, India (supervisor: Suneel Kumar Onteru). Jitendra proposes to identify and load therapeutic molecules into extracellular nanovesicles as a smart delivery tool to kill pathogenic bacteria in milk. Since the health of lactating mammals affects the quality of the milk they produce, bacterial diseases can be transmitted through milk. His work would enable the delivery of therapeutics to kill microorganisms causing milk-associated diseases.

Savitridevi Nadavurmath, Centre for Nano and Material Sciences - Jain University, India (supervisor: Gurunatha Kargall Laxminarayana). Savitridevi proposes to use strain as a method to tune the critical temperature for metal−insulator transitions in materials for applications in smart windows. Thermochromic windows may lower the energy required for heating and cooling buildings without compromising solar modulation efficiency.

REGION 4: THE AMERICAS

Xintong Yuan, University of California, Los Angeles, California (supervisor: Yuzhang Li), is the *Nano Letters* Seed Grant awardee from The Americas. She will combine four-dimensional scanning transmission electron microscopy (4D STEM) with cryo-electron microscopy to quantify the spatial distribution of components in the solid-electrolyte interphase of corrosion films in lithium−metal batteries, spanning length scales from nano- to micrometers. Establishing correlations with battery performance metrics could result in new design principles for next-generation batteries with high energy densities.

In alphabetical order of last name, the finalists from The Americas are:

Ruihan Guo, University of California, Berkeley, California (supervisor: Junqiao Wu). Ruihan aims to design an artificial in-memory gustatory neuron that can sense salt solutions and simultaneously memorize salt exposure history. Her proposal will help to understand the atomic mechanism of in-memory sensing and ion doping kinetics, which could hold promise for brain-like computing and robotic design.

Qi Li, University of Alabama, Alabama (supervisor: Chao Zhao). Qi will develop a light-triggerable nanoparticle platform that can be activated remotely and release loaded local anesthetics according to patient needs. His proposal could improve local anesthetics delivery and offer prolonged, effective analgesia with patient-managed control that is aligned with clinical needs and pain management strategies.

Kang Rui Garrick Lim, Harvard University, Massachusetts (supervisor: Joanna Aizenberg). Garrick will introduce a robust and modular colloidal templating method to tune and isolate metal−support interfacial interactions in heterogeneous catalysis. His proposal could offer molecular-level insights on the nature of the active sites at the metal−support interface to guide the rational design of heterogeneous catalytic systems.

Chuqiao Shi, Rice University, Texas (supervisor: Yimo Han). Chuqiao will combine 4D STEM with multislice electron ptychography to study domain switching dynamics and phase transitions in two-dimensional van der Waals materials. His proposed work could allow insights into the electronic structure−property relationships of SnSe and applications based on these and related materials.

Please join us in congratulating and celebrating these graduate students. We continue to be impressed by the scope of ideas and applications in nanoscience and are optimistic about the future of nanoscience and nanotechnology.

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Notes

Views expressed in this editorial are those of the authors and not necessarily the views of the ACS.

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