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EDITORIAL

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Nanoscale Horizons Emerging Investigator Series: Dr Mita Dasog, Dalhousie University, Canada

Our Emerging Investigator Series features exceptional work by early-career nanoscience and nanotechnology researchers. Read Mita Dasog's Emerging Investigator Series article 'Unlocking the secrets of porous silicon formation: insights into magnesiothermic reduction mechanism using *in situ* powder X-ray diffraction studies' (**https://doi.org/10.1039/D4NH00244J**) and read more about her in the interview below.

Dr Mita Dasog (she/her), FRSC, is an Associate Professor and Izaak Walton Killam Memorial Research Chair in the Department of Chemistry at Dalhousie University. She obtained her bachelor's degree in chemistry from the University of Saskatchewan, and then moved to the University of Alberta to begin her PhD studies with Professor Jonathan Veinot, where she focused on the syntheses, properties, and applications of silicon quantum dots. After a short stay at the Technical University of Munich as a Green Talents visiting scholar, Dr Dasog went on to hold an NSERC postdoctoral position with Professor Nathan Lewis at the California Institute of Technology, where she studied light–material interactions. Currently, her research group focuses on the development of photocatalysts, electrocatalysts, and refractory plasmonic nanostructures for water treatment and clean hydrogen production. She co-leads the Green Hydrogen Research Cluster at Dalhousie University and is an elected member of the Global Young Academy and the Royal Society of Canada College of New Scholars, Artists, and Scientists. Mita and her team's contributions have been recognized with many awards and honors, including selection as a Fellow of the Royal Society of Chemistry and Negative Emissions Scialog Fellow, and recognition as a top Canadian Water Shero by the Office of the Chief Scientist to the Prime Minister of Canada.

Read Mita's Emerging Investigator Series article 'Unlocking the secrets of porous silicon formation: insights into magnesiothermic reduction mechanism using in situ powder X-ray diffraction studies' (https://doi.org/10.1039/D4NH00244J) and read more about her in the interview below:

NH: Your recent Nanoscale Horizons Communication reports mechanistic insights into the pathways of the magnesiothermic reduction reaction of silica using in situ X-ray diffraction analysis. How has your research evolved from your first article to this most recent article and where do you see your research going in future?

MD: We have been exploring magnesiothermic reduction since the beginning of my independent career. In the very first paper from my research group, we focused on understanding how reaction parameters affect the properties of the porous silicon produced. However, as we encountered limitations with ex-situ analysis, it became clear that a more dynamic, in-depth approach was needed to capture the intricacies of the reaction pathways.

Our recent study, published in *Nanoscale Horizons*, employs an *in situ* technique, allowing us to gain a much more detailed understanding of the mechanistic pathways, including intermediate species, and providing new insights into reaction kinetics and structural evolution.

The next phase of this research is scale-up. Now that we understand the mechanism and the relationships between key parameters, we aim to apply this knowledge to produce porous silicon in bulk with controlled properties. Our goal is to transition from fundamental lab research to commercial applications, which we are doing by collaborating with industry partners.

NH: How do you feel about Nanoscale Horizons as a place to publish research on this topic?

MD: *Nanoscale Horizons* has been an excellent platform for publishing our research on magnesiothermic reduction and materials synthesis. The journal's focus on cutting-edge research at the nanoscale aligns well with our work, especially as it bridges fundamental insights and potential applications in materials science. The high visibility ensures that our findings reach a broad and relevant audience, including both academic and industry researchers interested in advanced material synthesis.

NH: What aspect of your work are you most excited about at the moment?

MD: Porous silicon is becoming a sought-after material for energy storage applications. We have started the scale-up work, which has introduced a new set of questions and challenges. I'm excited to use the knowledge we've gained over the last eight years studying this reaction to move towards large-scale production. It's not every day that I see work done in our lab being adopted by industry, and that really excites me.

NH: In your opinion, what are the most important questions to be asked/answered in this field of research?

MD: Currently, a lot of trial and error is needed to determine the best reduction conditions based on the starting magnesium particle size and silica source, which is time-consuming. If we want the magnesiothermic reduction reaction to be feedstock-flexible and tunable, we need a formula or model that can recommend reaction conditions based on starting materials, desired physical properties of the resulting porous silicon, and scale. This isn't simple, but I believe it's achievable, especially as we continue to collect more data. Developing such a model is crucial for enabling the practical use of this reaction in the field.

NH: What do you find most challenging about your research?

MD: A substantial amount of data is needed to develop the type of predictive model we envision, and it's challenging to achieve this alone. A centralized database or open-access repository would allow researchers to aggregate data from various sources, building a comprehensive resource for model development. With enough data, computational scientists and materials researchers could collaborate to create machine-learning algorithms or mechanistic models that predict optimal reaction conditions based on specific inputs. Integrating reaction kinetics, thermodynamic principles, and AI tools would further accelerate this progress. However, bringing together like-minded researchers to work toward this shared goal can sometimes be challenging.

NH: In which upcoming conferences or events may our readers meet you?

MD: I'll be honest, having a little one at home means my travel is quite limited, especially overseas. However, here are some Canadian meetings where folks can catch me next year: Atlantic ChemCon, the Canada-UK Symposium on Inorganic Chemistry (**https://fontaine.chm.ulaval.ca/symposium-2025?lang=en**), and the CSC Meeting (**https://www.cheminst.ca/conference/canadian-chemistry-conference-and-exhibition-csc-2025/**).

NH: How do you spend your spare time?

MD: In my spare time, you'll usually find me going on walks with my daughter, endlessly scrolling through YouTube videos on organizing (will my closet ever actually look that way?), learning to bake, and dabbling in new painting and art techniques. Here's our latest masterpiece: a pebble art creation my daughter and I made together after collecting these pebbles on our recent family vacation.

NH: Can you share one piece of career-related advice or wisdom with other early career scientists?

MD: I'll give it my best shot. Set realistic expectations, both in your career and personal life. In science – and any ambitious field – it's easy to set sky-high goals and expect every experiment, paper, or project to yield groundbreaking results. But real progress takes time and plenty of small steps, and it's normal for things to move slower than you'd like. Recognize that not every day (or even every year) will bring major milestones, and that's okay.

That said, remember that while guidance can be helpful, following too many opinions can dilute your instincts and unique perspective. So, take any advice with a grain of salt – and maybe a dash of skepticism – and carve your own path.