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Nanotechnology Research with Sustainability Considerations

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Nanotechnology Research with Sustainability Considerations

Each year for the past five years, the Sustainable Nanotechnology Organization (SNO) has partnered with a major journal to publish a sample of papers presented at its annual conference. In this issue of *ACS Sustainable Chemistry & Engineering*, we present papers from the 2017 SNO conference held in Marina del Rey, California, on November 5−7.

SNO is a nonprofit, worldwide, professional society composed of individuals and institutions that are engaged in research and development of sustainable nanotechnology; implications of nanotechnology for environment, health, and safety; advances in nanoscience, methods, protocols, and metrology; education and understanding of sustainable nanotechnology; and applications of nanotechnology for sustainability. SNO's purpose is to provide a professional society forum to advance knowledge in all aspects of sustainable nanotechnology, including both applications and implications.

The conference takes a systems approach to the topics presented. These topics represent broad issues that pertain to sustainability such as water, food and agriculture, green synthesis, medicine, and others. Each presenter is asked to articulate how their research aids sustainability. Specifically addressing sustainability issues in nanotechnology studies adds a unique element to the papers that we hope will permeate all the work in the field.

In this virtual special issue {https://pubs.acs.org/page/ascecg/vi/sustainable-nanotechnology.html}, papers address agriculture, water issues (both natural and treated water), and implications of exposure and hazard/toxicity, along with some that are more fundamental in scope. Regarding agriculture, Gardea-Torresday et al. address the effects of metal nanoparticles on plant growth, physiology, and nutrients; Ma et al. focus on soil treatment and effects of nanoparticles on seedlings. Ma's article addresses fungal disease suppression via nanoparticulate fungicide and Marmiroli's work examines nanoparticles' impacts on subcellular plant systems. The water-related papers address nanomaterials and water treatment, both in natural waters (Andreescu) and in wastewater (Wong). They also include models for biological accumulation of engineered nanomaterials in natural waters (Keller) and implications of copper nanoparticles on nitrogen cycling in natural systems (Mahendra). Other aspects of this virtual special issue emphasize potential adverse implications of nanomaterials such as inhalation exposure and modeling (Stintz), hazardous waste issues (Hristovski), and pulmonary toxicity (Aich). Finally, the virtual special issue includes fundamental papers that discuss modifying physicochemical properties of a metal oxide nanoparticle through metal adsorption (Ma) and examining the size and surface chemistry effects of surface binding (Ding). Nanomaterials examined throughout the papers include cerium oxide, zinc oxide, quantum dots, PAMAM dendrimers, copper, silver, and graphene oxide/ZVI, indicating the breadth of materials studied relating to sustainability.

The combination of nanotechnology research and sustainability issues is a distinguishing characteristic in all of these papers. It is through this type of research that we define sustainable nanotechnology with the prospect that future nanotechnology research will always consider sustainability.

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