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Editorial

Nanotechnologies for the treatment of water, air and soil

This issue contains 51 high quality contributions from prestigious groups from all over the world on the subject of Nanotechnologies for Treatment of Contaminated Water, Air and Soil.

The development of nanotechnologies is nowadays on the "crest of the wave" and the application in the environmental field illustrates the valuable contribution that advances in science and technology can make for global social and economic benefit.

Nanotechnologies comprise a broad range of tools, techniques, and applications and are widely perceived among the most significant technologies of the 21st century. Manufactured nanomaterials with structures ranging from 1 to 100 nanometers present unique physicochemical, surface and optoelectronic properties, which enable the solution of challenging problems that cannot be dealt with using conventional technologies. Nanotechnologies have now emerged as invaluable tools in the environmental context. Most visible examples are the removal of pollutants in water, air and soil. These applications trigger a number of associated efforts in the preparation of diverse nanomaterials, interdisciplinary studies on the characterization of the materials, along with studies to understand the potential risks and drawbacks in their use.

Lack of access to clean water and sanitation affects millions of people worldwide. Indoor and outdoor air decontamination techniques are essential to solve pollution problems in populated areas including megacities. Recovery and regeneration of contaminated soil are worldwide problems. For all the stated reasons, it is immediately apparent that nanotechnologies can lead to clear improvements for these problems in coming years. Nanotechnological based concepts, processes and products can be incorporated into specific devices for water, air and soil treatment, offering more effective, efficient, durable, environmentally friendly and affordable approaches that can lead to more cost-effective, less time, less energy consuming and less waste generation technologies than those based on conventional bulk materials.

Original research articles as well as review articles in this special issue present new findings on the following aspects:

(1) Preparation and characterization of nanomaterials useful for environmental purposes including green chemistry principles (11 articles).
(2) Novel reactions that can be accomplished at the nanoscale for environmental applications (2 articles).
(3) Nanomaterials for water treatment (surface water, groundwater, residual water and water potability) (9 articles).
(4) Nanomaterials for indoor and outdoor air treatment including vehicle and industrial exhausts (9 articles).
(5) Membrane technologies using nanoscale pores (nanofiltration) for reverse osmosis and ultrafiltration (including desalination technologies) (5 articles).
(6) Nanoadsorbents for removal of pollutants in water, air and soil (3 articles).
(7) Nanotechnology based reactors and photocatalytic reactors (2 articles).
(8) Magnetic nanoparticles as especial materials with easy removal from treated media (2 articles).
(9) Nanosensors for detection of contaminants (3 articles).
(10) Potential impact of nanoparticles on environment and biota (5 articles).

All published papers have been accepted after a rigorous peer review process. Under such circumstances, as Guest Editors, we believe that this special issue will be beneficial to the environmental readership worldwide.

We would like to thank all the authors and reviewers for their contribution to making this such a successful issue. Finally, we thank the editorial board of the Journal of Hazardous Materials for giving us the opportunity to publish this special issue.

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