

# Preface

The smallest parts of the matter are referred to as nanomaterials and the materials when put to use are known as functional materials. The discovery of these nanomaterials is widely acknowledged as a major triumph of human ingenuity in modern times. This discovery has led to the emerging field of nanotechnologies, which is paving the way for a new technological revolution. Such developments may usher in new industrial revolutions, capable of radically transforming almost (everything) in all industrial sectors in the coming years. Most of the industries have already begun to establish a significant share in the global market and are expected to exert a major beneficial impact on every sphere of life.

Among the top challenges across the globe is of energy and environment. They are of incredible magnitude. Solving problems, like energy which is the largest enterprise of humanity on the horizon, would go far toward solving many of humanity's other most pressing problems, such as food and water supplies, environmental degradation, and poverty because they are so directly affected by the availability of energy.

Environmental nanotechnologies have the possibility to contribute to economic growth and innovation while at the same time allowing sustainable development and protecting the environment. Various applications of nanotechnologies for environmental remediation have been successfully demonstrated at the laboratory scale but, in the majority of cases, these still require verification of their efficacy and safety in the field. Conventional remediation technologies have so far have shown only limited effectiveness in reducing the levels of pollutants in the air, water, and soil and in responding to the challenges of major cleanup operations. Present day filtration and purification plants used for supplying drinking water generally achieve only partial success because the active materials are of limited efficiency. However, because of their much greater specific surface area, nanoparticles are able to perform significantly more effectively as filtration media than larger particles with the same chemical composition.

Materials with small dimensions increase the strength as well as enhance efficiencies of monitoring devices, remediation of environmental pollution and renewable energy production. Nanoscale materials will make the products better in terms of functionality, weight savings, less energy consumption and a cleaner environment. Choosing the right nanoscale materials is one of the key parameters for the future direction of nanotechnology. There is no doubt that nanotechnology will continue to develop, be a benefit to society and improve the energy efficiency and environment in various ways. Shortcomings always exist when new unproven technology is released and hopefully will be vanishing soon.

Thus, this special issue on the 'Functional Nanomaterials for Energy and Environmental Applications' aims to present the current research and to identify future priority and directions in design and applications for energy and environment.

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