

## Nanotechnology Research – Enabling a Holistic Approach to Achieving Sustainability

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Nanotechnology offers tremendous potential for environmental assessment, improvement, and protection. These advantages are enabled through in various ways including: novel sensing devices that are miniature, multi-analyte and multi-functional; rapid, inexpensive and effective remediation techniques and materials; processing techniques that enable reductions in waste generation and raw material requirements; and minimization in water and energy demands for processing and manufacturing. To take full advantage of the benefits nanotechnology can bring about, we must adopt a proactive and holistic approach towards assessing potential environmental effects and understanding social, ethical and legal implications.

Such an approach necessitates the assessment of impacts throughout the complete material life cycle – from acquisition of raw materials, through product development (first, second, third, etc.), through product use or misuse (unintentional as well as intentional), to the reuse/recycle or disposal of the material or product. For emerging materials such as engineered nanomaterials, this outlook is especially critical because these materials may go from exhibiting toxicity to exhibiting no toxicity as a result of alterations in morphological or surface properties or charges in charge. In addition, social sciences are important for assessing potential societal impacts and understanding societal challenges. Sustainability cannot be achieved within a vacuum of developing and applying novel technologies. Careful consideration of environmental justice, equity, access, public health and environmental quality should be undertaken concurrently.

This lecture will discuss specific research activities in the area of environmental nanotechnology with the goal of fostering such an approach. Possible collaborative activities between American and Korean researchers, government agencies and non-government organizations will be proffered as possible paths to achieve the goal of a healthy global public, environment and economy.