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Towards Regulating Engineered Nanomaterials: A Framework as a Tool for Overcoming the Existing Limitations

Abstract

The observed rapid increase in production and use of engineered nanomaterials has stimulated public concern for creation of a regulatory platform capable of adequately addressing the risks associated with this novel class of materials. Unfortunately, the unique properties and wide diversity of engineered nanomaterials have rendered the existing risk-assessment/risk-management approaches unsuitable for regulating these novel materials. The development of a new risk assessment/risk management approach is needed. This uneasy task, however, is hindered by two existing major limitations. The first limitation stems from challenges associated with the limited number of existing protocols, methods, techniques, and tools needed for enforcing any anticipated regulations pertaining to engineered nanomaterials. The second limitation stems from the fact that environmental or product matrices, to large extent, affect and transform the physical, chemical, and biological properties of engineered nanomaterials. Development of a framework, which recognizes (1) the relationships among different elements of the environmental and anthropogenic systems and (2) the effects that these elements may have on transformation and transport of engineered nanomaterials across their boundaries, would help to address these major limitations. This paper examines a suggested framework that will serve as a tool for developing a regulatory platform suitable for ensuring safe use of engineered nanomaterials. The framework follows the release and transformation pathways of engineered nanomaterials from anthropogenic point and non-point sources into the air/water/soil/waste elements of the environment to identify the most suitable alternatives for developing regulatory barriers to prevent and minimize environmental and health risks.