Issues in Assessing the Fate of Manufactured Nanomaterials in Porous Media

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Abstract

Manufactured nanomaterials (MNs) are commonly defined as being commercial products with at least one dimension in the size range of 1 nm -100 nm and that possess unique properties as the result of their size. Anecdotal evidence suggests that more than 600 products containing MNs are currently entering commerce; however, questions exist within the regulatory community as to whether existing national and international property test guideline procedures generate information useful for adequately assessing the risks posed by MNs that are intentionally or unintentionally introduced into the environment.

MNs represent the smaller size fraction of traditional colloidal particles. In contrast to soluble or insoluble contaminants present in aquatic media, procedures for assessing the fate, transport and persistence of colloidal contaminants in aquatic environments are not nearly as well developed and these systems are often poorly understood. In addition, virtually all recent research publications describing the environmental toxicology and fate of MNs recommend a suite of additional characterization procedures that are not customarily applied to traditional chemical products.

This presentation will summarize recent findings by Loux and Savage (2008, *Water, Air and Soil Pollution*, In press) concerning the applicability of the Derjaguin-Landau-Verwey-Overbeek theory of colloidal particle stability for assessing the likelyhood of metal oxide nanomaterial self aggregation in environmental aquatic media. Self aggregation will likely reduce the aquatic environmental transport of MNs and thus likely reduce potential biological exposures to these products. Findings from the work suggest that two non-traditional property characterization parameters (zeta potentials and Hamaker constants) may be necessary for assessing the potential aquatic environmental transport of MNs. Alternatively, if it can be definitively established that the long-term zeta potentials of colloids in environmental aquatic media have an absolute value less than 25 mV, then the complexity of assessing the aquatic fate of these products may be greatly reduced.

Discaimer: *This abstract was not reviewed by EPA and hence none of the viewpoints expressed within this abstract should be considered to represent official agency policy.*