

Gradient Corporation



NEWS ALERT

Nanotechnology for Environmental Remediation: What You Should Know

In October 2008, the US Environmental Protection Agency (US EPA) released a fact sheet providing an overview on the use of nanotechnology in environmental remediation ([US EPA Fact Sheet, 2008](#)). Because of their increased reactivity due to smaller size and larger surface area, nanomaterials are gaining prominence for *in situ* remediation or sequestration of chlorinated solvents (TCE, PCE), PCBs, DNAPL, and heavy metals (chromium). Thus, the full-scale field testing of this technology has been increasing significantly in an effort to develop this potentially more effective and economical remedial technique.

Gautham Jegadeesan, Ph.D., an expert in the use of nanomaterials for remediation who recently joined Gradient Corporation as an Environmental Engineer stated, "It is estimated that the production of specific nanomaterials for environmental remediation will increase drastically in the next decade, largely due to their unique functionalities. In fact, the most recent advances in nanomaterial technology have been the ability to design and produce materials that are geared for specific remedial solutions and also eliminate the generation of undesirable remediation byproducts, which can occur with most macro-scale materials." Dr. Jegadeesan's specific expertise includes the characterization and evaluation of engineered nanomaterials for environmental remediation, and analysis of their fate and transport in the environment. His work has shown that, compared to traditional technologies, bimetallic nanomaterials, nZVI, and nano-titanium oxide can greatly enhance contaminant removal.

Fate, Transport, and Toxicity Issues

As promising as the site remediation applications of nano-sized materials and structures are, there are several unanswered questions relating to their potential toxicity, and whether their transport, potential transformation, and fate in the environment could potentially result in elevated risk to ecosystems and human health. The same unique functionalities that make nanomaterials so attractive for contaminant remediation could make them potentially harmful under some circumstances. "Since the nanomaterial can travel longer distances in the environment due to their size compared to their macro-sized counterparts, can they also transport contaminants attached to them during the sequestration process over such distances? If so, the consequence of such a mechanism could be a toxic effect from either the nanomaterials themselves, the contaminant, or, in a synergistic way, a combination of both, not at the contaminated site but at a location away from the site," Jegadeesan said. "In addition, tailoring the nanomaterials for specific remedial applications has added additional variables in the hierarchy of unknowns on nanomaterial toxicity and risks." For all these reasons, case-by-case fate, transport, and risk assessments should be considered when using these materials for remedial purposes.

Addressing Nanotechnology Risk Issues

Led by Dr. Barbara D. Beck and Dr. Christopher M. Long, Gradient's Nanotechnology Risk practice is experienced in addressing the potential human health and ecological impacts of engineered nanomaterials. In fact, Gradient has prior experience conducting a qualitative risk assessment for the use of nZVI in the remediation of TCE in groundwater. With the addition of Dr. Jegadeesan's experience

For more information on Gradient's Nanotechnology Services, contact:

Barbara D. Beck, Ph.D., DABT,
Principal
bbeck@gradientcorp.com

Christopher M. Long, Sc.D.,
Principal
clong@gradientcorp.com

Gautham Jegadeesan, Ph.D.,
Environmental Engineer
gjegadeesan@gradientcorp.com

Gradient's Nanotechnology Team can help you develop comments or implement strategies. To learn more, [click here](#).



Gradient Corporation
20 University Road
Cambridge, MA 02138
Phone: 617-395-5000
www.gradientcorp.com

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in nanotechnology fate and transport to Gradient's strong capabilities in nanomaterial exposure assessment and toxicology, Gradient is well-equipped to perform evaluations of engineered nanomaterials for use in environmental remediation.

About Gradient Corporation

Gradient Corporation is an internationally recognized environmental and risk science consulting firm with over 20 years of expertise in Contaminant Fate and Transport, Environmental Chemistry, Toxicology, Risk Assessment, and Product Safety. We employ sound science to devise and implement cost-effective strategies for addressing chemicals in the environment, in the workplace, and in products throughout their lifecycles. Our rigorous analysis and expert negotiation skills achieve innovative and value-added solutions to help our clients meet their business goals while protecting human health and the environment. From our offices in Cambridge, MA, and Seattle, WA, we provide national and international clients with the technical expertise and knowledge required to address their most complex environmental and health-related matters. For more information visit www.gradientcorp.com.

