Auburn University

Innovation Advancement & Commercialization

Improved Destruction of Chlorinated Compounds in Soil and Groundwater

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Reference: Dechlorination

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Overview

Auburn University is seeking licensees for an improved remediation technology for the *in situ* destruction of chlorinated organic compounds such as TCEs (trichloroethylene) and PCBs (polychlorinated biphenyls). This new process dramatically enhances the dechlorination rates of existing palladized iron nanoparticles. It has the potential to not only achieve complete remediation of contaminated sites in a much shorter time than current technologies but also to enable remediation of some compounds currently considered untreatable.

Advantages

- Substantially increases the stability and reactivity of palladized zero-valent iron nanoparticles
- Substantially increases the rate of dechlorination of chlorinated organic compounds: a 25-fold increase in initial degradation rate for TCE and an 80% elimination of PCB in 100 hours has been shown
- Reduces costs by enabling *in situ* treatment and by decreasing time and materials needed
- Uses an inexpensive and environmentally friendly stabilizer
- Prevents detectable formation of toxic intermediates
- Prevents aggregation of nanoparticles, allowing for *in situ* use

Visual comparison of nano-particle stability after five days: stabilized (left) vs. unstabilized (right)

Description

Palladized zero-valent nanoparticles are known to serve as catalysts for the breakdown of chlorinated hydrocarbons such as TCE and PCBs. Unfortunately, these particles tend to be unstable, largely due to agglomeration. This leads to vastly reduced reactivity and can cause the particles to become trapped in sub-surface soil, making them impractical in the field. In addition, toxic intermediate by-products such as vinyl chloride are often produced using these particles.

This technology modifies the preparation of bimetallic particles by adding a very low-cost stabilizer to prevent the nanoscale particles from agglomerating, thereby maintaining their high surface area and reactivity. These stabilized nanoparticles demonstrate much higher reactivity than any other nanoparticles reported to date. In the treatment of TCE, target concentrations were achieved in half the time as compared to the best reported results for other technologies; for PCB, over 80% was degraded within 100 hours, compared to only 24% with unstabilized particles. In both cases no toxic intermediates were detected.

Status

- Subject of US Patent 7,887,880
- This process has been experimentally verified with TCE and PCBs

Licensing Opportunities

- This technology is available for immediate non-exclusive licensing through Auburn's customizable "Ready to Sign" licensing program.
- Similar patents are available in the Remediation Technology field.

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