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Improved Destruction of Chlorinated Compounds in Soil and Groundwater

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Reference: Groundwater Dechlorination

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Overview

Auburn University seeks a licensee or development partner for an improved remediation technology for the *in situ* destruction of chlorinated organic compounds such as TCE (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 PCBs in 100 hours have been shown
- Reduces costs by enabling *in situ* treatment and by lowering 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 the stability of Auburn's nanoparticles (left) vs. unstabilized particles (right) after five days

Description

Palladized zero-valent iron nanoparticles have shown 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 also cause the particles to become trapped in sub-surface soil, making them impractical for *in situ* use. 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 PCB, over 80% was degraded within 100 hours, compared to only 24% with unstabilized particles. In both cases no toxic intermediates were detected.

Status

- A PCT patent application has been filed
- This process has been experimentally verified with TCE and PCBs

Licensing Opportunities

- This technology is available for exclusive or non-exclusive licensing
- Joint development opportunities include funded research or joint venture