Remediation of Polluted Water by Reductive Transformation Reactions (Yeda)

code: T4-1265

Brian Berkowitz, Chemistry, Environmental Science and Energy Resources

Summary

A Novel water treatment method capable of handling a wide spectrum of pollutants, both organic and metallic was developed by the group of Prof. Berkowitz and proven in large scale.The combination of ever-growing contamination from various sources (industry, agriculture and domestic uses), the toxicity of contaminating compounds, and their extreme persistence in the environment, define a complex challenge and serious threat. Feasible technological responses to deal with growing deterioration in water resource quality are difficult to develop, largely because of the wide variety of contaminants having different properties, the stringent environmental standards that must be met, and the inherent heterogeneity of natural aquatic systems. The quest for cost-effective, environmentally-acceptable methods that can target a wide spectrum of contaminants, in situ and ex situ, is urgent and critical today more than ever.The approach of the technology presented here is to reduce their oxidation state, i.e., to transform them electrochemically. In most cases, complete transformation of contaminants from the oxidized-organic group produces environmentally innocuous compounds, while reduction of heavy metals renders them insoluble and immobile, and therefore much less harmful. These treatment methods can be applied both in situ and ex situ for decontamination of soils, sediments, water, wastewater and gaseous process streams.

Applications

Polluted water and wastewater treatment. Soil decontamination. Gaseous process stream treatment.

Advantages

Environmentally friendly output.   Cost effective. Can be applied in situ as well as ex situ.

Technology's Essence

The treatment method presented here is based on nanosized zerovalent iron (nZVI) particles and cyanocobalamine (vitamin B12) on a diatomite matrix. Cyanocobalamine is known to be an effective electron mediator, having strong synergistic effects with nZVI for reductive dehalogenation reactions. This composite material also improves the reducing capacity of nZVI by preventing agglomeration of iron nanoparticles, thus increasing their active surface area. The porous structure of the diatomite matrix allowshigh hydraulic conductivity, which favors channeling of contaminated water to the reactive surface of the composite material resulting in faster rates of remediation. The composite material rapidly degrades or transforms completely a large spectrum of water contaminants, including halogenated solvents like TCE, PCE, and cis-DCE, pesticides like alachlor, atrazine and bromacyl, and common ions like nitrate, within minutes to hours.

Contact for more information:

Maya Gofer,   Licensing Officer,   +972-8-9344546

Yeda Research and Development Co. Ltd. - Technology Transfer from the Weizmann Institute. P.O. Box 95, Rehovot,76100, Israel. Tel: +972-8-947-0617