Biological Remediation of Chlorinated Organic Pollutants

Chlorinated hydrocarbons are a class of toxic chemicals found frequently in the industrial wastewater, soils and groundwater. Non-invasive bioremediation approaches are rapidly becoming the method of choice over conventional physical and/or chemical remediation processes. In sites contaminated by chlorinated organic pollutants, such as chlorinated ethenes, reductive dechlorination by bacterial isolates in-situ is often unstable and highly susceptible to inhibitory effects from co-contaminating non-substrate halogenated compounds. Use of undefined mixed cultures to cope with indigenous microbial communities rarely works efficiently.

This technology relates to a defined microbial consortium capable of (i) complete dehalogenation of polychlorinated ethenes (PCE and TCE) to non-toxic ethene as well as (ii) dehalogenating the common soil and groundwater co-contaminants 1,1,1-trichloroethane and chloroform.

The microbial consortium can make use of lactate or pyruvate as sources of carbon for growth, be established in microaerobic, anaerobic or anoxic environments and can be established without specific amendment of electron donors (e.g. hydrogen). It can utilize a broad range of chlorinated hydrocarbons for metabolic dehalogenation, including: tetrachloroethene, trichloroethene, dichlorethene isomers, vinylchloride, 1,2-dichloroethane, 1,1,1-trichloroethane, 1,1,2-trichloroethene and chloroform. The microbial consortium can be cultured in the presence of one or more halogenated compound to a maximum nominal concentration of 500µM.

This technology is suitable for bioremediation companies for application on polluted sites.

Potential Applications

- Bioremediation of chlorinated organic pollutants such as chlorinated ethenes, polychlorinated ethenes, trichloroethane, 1,1,1-trichloroethene and chloroform
- Microbes can be adapted to degrade other types of pollutants.

Customer Benefits

- Non-stringent requirements - microaerobic, anaerobic or anoxic environments without specific amendment of electron donors (e.g. hydrogen)
- Easy to cultivate - Ability to utilize a variety of carbon sources, electron donors and electron acceptors
- Limits environment risks - knowledge of all strains used in the microbial consortium

Technology Features & Specifications

The defined bacterial consortium exhibits increased metabolic flexibility and vigor compared to individual organohalide respiring populations and is capable of maintaining complete dechlorination of tetrachloroethene and trichloroethene in the presence of environmentally relevant concentrations of the inhibitors chloroform and 1,1,1-trichloroethene.

One or more of the strains in the defined consortium are proprietary strains isolated and adapted by the inventors for this application.

The construction of a unique, defined, detoxifying microbial consortium represents a significant advance to existing approaches by providing robust degradation capabilities of a defined and well characterized microbial community as well as the ability to tailor the populations within the indigenous microbial community for specific biotransformation or detoxification goals.

For more information on technologies we have to offer, please visit our website at https://www.ipi-singapore.org or enquire at techscout@www.ipi-singapore.org