

## Aerobic biodegradation of trichloroethylene by a mixed culture

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### Abstract

Trichloroethylene (TCE), a widely used industrial solvent, is a highly volatile low-molecular-weight organic pollutant that has contaminated soil and groundwater. The U.S. Environmental Protection Agency (EPA) has established a maximum contaminant level of 5 parts per billion (ppb) for this contaminant in drinking water supplies because of its suspected human carcinogenicity. Research has shown that TCE can be degraded anaerobically by reductive dechlorination, but usually a product of this degradation is the highly carcinogenic compound vinyl chloride (Vogel and McCarty, 1985). Current research is showing that TCE can be degraded aerobically by bacteria that utilize aliphatic hydrocarbons such as methane or propane as the primary sources of energy (Wackett et al., 1989) (Fliermans, et al, 1988).

A consortium of bacteria previously exposed to TCE were acclimated to two separate environments containing different TCE concentrations mixed with air and propane by continuously sparging TCE as a vapor. These bacteria were used for batch respirometric analysis of growth and degradation kinetic parameters. Respirometric biokinetic parameter determination requires biomass growth, substrate utilization and product formation rate equations in conjunction with oxygen consumption rates. The oxygen consumption data was developed from applying various initial concentrations of TCE to eight separate respirometric batch reactors while maintaining oxygen and propane concentrations constant. This provided information for initial parameter estimates in a non-linear curve fitting model for simultaneous solution of the rate equations.