Simultaneous Degradation of Commingled Contaminants by a Microbially-Driven Fenton Reaction Operated in Fed-Batch and Flow-Through Reactor Configurations

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The microbially-driven Fenton reaction may be induced in situ by exposing Fe(III)-reducing facultative anaerobes in Fe(III)-containing contaminated environments to alternating aerobic and anaerobic conditions via alternating injections of compressed air and nitrogen. Degradation of other recalcitrant compounds including perfluoroalkyl substances (PFAS) in batch, fed-batch and flow-through reactor systems.

Method development: Can the microbially-driven Fenton reaction degrade PFOA?

Conclusions

• In contrast to the purely abiotic chemical Fenton reaction, addition of exogenous H2O2 is not required to drive the microbially-driven Fenton reaction, and maintaining low pH conditions is unnecessary

• Our flow-through reactor system may be efficient at degrading chlorinated and other recalcitrant compounds that are resistant to normal enzymatic attack

• Optimal suboxic conditions may be produced by (1) Feeding aerobic lactate inlet streams with varying lactate concentrations, or (2) Varying aerobic inlet flow rates at constant lactate concentrations

Future directions

• Further manipulation and optimization of environmental conditions in the flow-through reactor system to mimic a more natural subsurface environment for microbial degradation of contaminants

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