Reductive dechlorination of trichloroethylene (TCE) in competition with Fe and Mn oxides – observed dynamics in H2-dependent terminal electron accepting processes

The determination of hydrogen (H2) concentration together with the products of microbial reduction reactions in a trichloroethylene dechlorinating system is conducted to delineate the ongoing predominant terminal electron accepting processes (TEAP). Formate was used as electron donor and synthetic Fe minerals or environmental samples were used as the substrata. Iron(III) and Mn(IV) reduction limited microbial dechlorination by the mixed anaerobic culture by decreasing the level of H2 in the system. The H2 measurements indicated that the H2 concentration at which different TEAPs occur can overlap and thus these TEAPs can therefore occur concurrently rather than exclusively. Difference in Fe(III) bioavailability and hence, Fe(III) reduction partially explain this wide range. The distinction between dechlorination and other microbial reduction processes based on H2 threshold values is not feasible under such conditions, though there appears to be a relation between the rates of H2 consuming process and the observed H2 level.

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