PARAFFIN CONTROL IN OIL WELLS USING ANAEROBIC MICROORGANISMS

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Paraffin deposits have been implicated in numerous and costly oil field production problems. Since anaerobic conditions usually predominate in oil reservoirs, we explored the use of anaerobic microbial populations for paraffin alteration. We enriched for a variety of anaerobic populations from hydrocarbon-contaminated sites. We selected for organisms that could biodegrade waxy, long-chain hydrocarbons up to C50 in length, the largest n-alkane reported to be metabolized. Microbial communities enriched from a variety of marine sediments with C28, C40 or C50 as sole paraffin substrates showed enhanced levels of sulfate reduction or methane production relative to substrate-free controls. Molecular analyses of the paraffin-degrading enrichments by denaturing gradient gel electrophoresis, cloning, and sequencing of the 16S rDNA (~1500 bp) revealed a close affinity of the organisms to known hydrocarbon-degrading sulfate-reducing delta proteobacteria. In separate experiments, sediment-associated populations enriched from a freshwater, gas condensate-contaminated aquifer showed enhanced levels of sulfate reduction relative to controls when supplied with Polywax, a commercially-available high molecular weight waxy mixture (~C30 to C100). Transfers of these enrichments continued to show enhanced levels of sulfate reduction when supplied with actual paraffin samples from oilfield equipment. All cultures were promising for the prospective biotreatment of problems associated with the recovery of paraffinic oils. Ongoing work is designed to determine how the large molecular weight alkanes are metabolized by the cultures and how the microorganisms can be optimized and applied in paraffin control measures.

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