

A Pilot Test of a Surfactant-Modified Zeolite (SMZ) Permeable Barrier for Chromate and PCE Removal

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Abstract

Laboratory studies indicate that surfactant-modified zeolite (SMZ) is effective in simultaneous removal of multiple types of contaminants from water, is long-term chemically and biologically stable under aggressive conditions, has minimal impact on subsurface microorganisms, and may be regenerated after saturation with various contaminants. The current phase (phase II) of the research aims at verifying most of the laboratory results at a pilot scale on a field demonstration. Bulk SMZ production (20 tons) has been successfully demonstrated using standard particle processing equipment at a cost of approximately \$400-450/ton (\$12/ft³). The test is being conducted in a 8.5-m x 3-m tank filled with medium to fine-grained sand with the SMZ barrier of 6-m long, 2-m deep, and 1-m thick installed in the center of the tank. Five injection and five withdrawal wells are used to establish the flow field and to deliver synthetic contaminated groundwater containing 10 mg/L chromate and 1mg/L PCE. Anticipated duration of contaminant introduction will be four months followed by sodium dithionite regeneration to immobilize chromate on the SMZ and air-sparging to strip PCE from the SMZ. Water samples will be taken from 81 monitoring wells, each with 5 sampling levels. Chromate and PCE concentrations across the barrier and the aquifer will be analyzed weekly. The overall barrier performance will be evaluated by comparing the experimental results with MODFOW/MT3D model prediction.