

บทคัดย่อภาษาอังกฤษ

A slow-release oxidant candle is an emerging technology being used to deliver chemical oxidants for groundwater remediation. The objective of this study was to quantify the efficacy of slow-release persulfate candles to treat an organic contaminant in a long-term and controlled manner. The release characteristics of slow-release persulfate candles (1:3, wt/wt, paraffin:Na₂S₂O₈) with and without ZVI candles (1:4.7, wt/wt, paraffin:Fe⁰) under batch conditions were quantified. Batch results showed that PS+ZVI candles initially released a large mass of PS with concentrations reaching 5,000 mg/L, which would be sufficient to treat most prominent organic contaminants. This passive in-situ technology was able to completely degrade an aqueous solution of methyl orange (MO, 100 mg/L), which served as an organic contaminant surrogate, in 50 h. By using a stacked array of PS+ZVI candles in a saturated sand tank (70 x 30 x 3 cm) with 2 mL/min flow rate and spatially sampling throughout the tank with time, the PS distribution pattern and zone of influence were determined. Results showed the uneven PS distribution toward the bottom of the tank and MO concentration decreased by 90% in 36 h from both the sampling array and the effluent ports from the 2D-tank. A longevity study projected that using this PS+ZVI formula to create candles will negate the need for oxidant replenishment. These results support the use of the slow-release PS+ZVI candles as a practical approach for long-term in situ remediation of contaminated aquifers.