

## Removal characteristics of phenol using horseradish peroxidase (HRP)-mediated polymerization in saturated porous media

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### ABSTRACT

This paper reports experimental results, demonstrating the feasibility of horseradish peroxidase (HRP) and  $H_2O_2$  to reduce phenol transport in saturated porous media. A laboratory-scale packed column reactor (ID: 4.1 cm, sand-bed height 12 cm) column was utilized to simulate injection of HRP and  $H_2O_2$  into an aquifer contaminated with phenol. Effluent concentrations of phenol and polymerization products were monitored before and after enzyme addition under various experimental conditions (enzyme dose: 0–2 AU/mL, [ionic strength]: 5–100 mM, pH: 5–9). The concentration of phenol in the column effluent was found to decrease by nearly 90% in the presence of HRP (2 AU/mL) and  $H_2O_2$  in the continuous flow system at pH 7 and ionic strength 20 mM. The influent phenol was converted in the system to insoluble precipitate, which deposited in pore spaces. The remains were discharged as soluble oligomers. About 8% of total pore volume in column system was decreased by deposition of polymer produced.

*Keywords:* Phenol; HRP; Polymerization; Soluble and insoluble polymer; Saturated porous media

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