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Sustained-Release Persulfate Tablets for Groundwater Remediation

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Abstract : Contamination of soil and groundwater has become a serious and widespread environmental problem. In this study, sustained-release persulfate tablets were developed using persulfate powder and a modified cellulose binder for organic-contaminated groundwater remediation. Conventional cement-based persulfate-releasing materials were also synthesized for the comparison. The main objectives of this study were to: (1) evaluate the release rates of the remedial tablets; (2) obtain the optimal formulas of the tablets; and (3) evaluate the effects of the tablets on the subsurface environment. The results of batch experiments show that the optimal parameter for the preparation of the persulfate-releasing tablet was persulfate:cellulose = 1:1 (wt:wt) with a 5,000 kg F/cm2 of pressure application. The cellulose-based persulfate tablet was able to release 2,030 mg/L of persulfate per day for 10 days. Compared to cement-based persulfate-releasing materials, the persulfate release rates of the cellulose-based persulfate tablets were much more stable. Moreover, since the tablets are soluble in water, no waste will be produced in the subsurface. The results of column tests show that groundwater flow would shorten the release time of the tablets. This study successfully developed unique persulfate tablets based on green remediation perspective. The efficacy of the persulfate-releasing tablets on the removal of organic pollutants needs to be further evaluated. The persulfate tablets are expected to be applied for site remediation in the future.

Keywords : sustained-release persulfate tablet, modified cellulose, green remediation, groundwater
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