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DESORPTION KINETICS OF THERMAL ENHANCED SOIL VAPOR EXTRACTION ON HYDROCARBON REMOVAL IN SIMULATED AND MODIFIED SOILS

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Abstract

Different from the traditional research on the influencing factors, the paper combined the thermal enhanced extraction technology with desorption kinetics to study the removal effect of hydrocarbon contaminated soil in depth. Research for the effect of gas flow rate, gas water content (GWC), soil water content (SWC) and modified soil on the removal rate of hydrocarbon pollutants. The physical and chemical properties of soil restoration were detected by FT-IR, BET and SEM-EDS. The calculated kinetic constant (k) in LDF kinetic equation was basically stable after the gas flow rate more than 80 mL·min^{-1}. When GWC raised to 15%, the numerical changed obviously. While SWC increased to 10%, R^2 (R^2=0.9849) reached maximum. Among the modified soils, k decreased from 0.01487 to 0.00283 and the desorption rate remained around 99% as acid modified soil with short desorption time (from 330 to 270 min). Compared with the experimental data, the LDF kinetic equation was more suitable for the study of single-component kinetic process. Freundlich kinetic equation was fit for complex-component (water-contained) kinetic process. The changes in soil structure, porosity and elements caused by acid, alkali and salt modification had an impact on the rate of thermally enhanced soil vapor extraction (T-SVE) to remediate contaminated soil. At the end of remediation in the acetic acid modified soil, the average concentration of pollutants was reduced from 127569 to 848 mg/kg, corresponding to 99.3% of mass removal.

Key words: desorption kinetics, hydrocarbon contaminated soil, modified soil, thermally enhanced soil vapor extraction

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