Effect of Meteorological Conditions on Pollutants Removal and Enhancing Approaches During Photovoltaic Energy Direct Application: Electrokinetic Remediation of Soil Containing Cr(VI) as an Example

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To explore the effect of meteorological conditions on pollutants removal and enhancing removal efficiency approaches in weak solar irradiation intensity during photovoltaic energy direct application, electrokinetic remediation of soil containing Cr(VI) was investigated as an example. The results show that meteorological conditions have a significant effect on pollutants removal, and Cr(VI) removal efficiency for a sunny day is the highest. Cr(VI) concentration and total Cr concentration in the different layer suggest that chromium in soil is electromigrated and accumulated near the anodic region. Total Fe concentration implies that the anodic product Fe^{2+} is migrated into the cathode. Energy conversion efficiency for a sunny day is the highest and is 10.4%. However, energy utilization efficiency for an overcast day is the highest, and E_m and E_v are 24.1kWh/kg and 38.3kWh/m³, respectively. In weak solar irradiation intensity of $37 \pm 3.5 \text{ W/m}^2$, the parallel connection of photovoltaic panels is a feasible approach to enhance pollutants removal, and in 30min Cr(VI) removal efficiency for four panels can rise to 79.8% from 64.3% for only one panel. The extending reactive time is also a feasible way, and removal efficiency for one panel can increase from 64.3% to 80.7% as time prolonging from 30 min to 60 min.

Keywords: Meteorological conditions, Photovoltaic energy, Pollutants removal, Enhancing approaches, Soil containing Cr(VI)

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