

Fluoride Sorption-desorption and Isotherm Hysteresis in a Calcareous Soil in Isfahan

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Abstract

The sorption and desorption of fluoride by soil can play an important role in the transport of fluoride in soil. The study was conducted on the soil from Isfahan University of Technology research station site (two depths of 0-30 and 30- 60 cm). Fluoride sorption reactions were examined by equilibrating 0, 2.5, 5, 10, 25, 50 and 100 mg L⁻¹ NaF solution with soils for 23 hr. The desorption experiments were performed using 0.03 mol L⁻¹ NaCl solutions immediately following the completion of sorption experiments. The sorption isotherms of F were well described by the Langmuir and Freundlich models. The n values for Freundlich isotherm were 0.57 and 0.55 for two depths of the studied soil, respectively. The k_F values for Freundlich isotherm were 0.026 and 0.025 mg⁽¹⁻ⁿ⁾ Lⁿ g⁻¹ for two depths, respectively. Maximum monolayer sorption capacities (q_{max}) were obtained to be 0.4 and 0.35 mg g⁻¹ for 1 and 2 layers of the studied soil, respectively. The desorption isotherms of F were well described by the Freundlich model. The fitted model parameters' (k_F and n) values for desorption branches were larger than these values for sorption branches. Also, the results showed a positive hysteresis (n_{desorb} < n_{sorb} and k_{desorb} > K_{sorb}). It seems fluoride sorption to be reversible.

Keywords: Fluoride, Sorption, Desorption, Hysteresis, Langmuir, Freundlich.

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