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Sorption and desorption behavior of lead in four different soils of India

PDF (Size: 311KB) PP. 41-48 DOI: 10.4236/as.2011.21007

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ABSTRACT

Sorption and desorption mechanisms of lead (Pb) were determined in four different soils collected from different agro-climatic regions of India. The soils were classified as: fine loamy mixed Typic- Dystrudepts, fine sandy loam Typic Ustochrepts, fine loamy Typic Ustochrept, and fine sandy loam Udic Haplustalfs. Seven different Pb solutions [Pb(NO₃)₂ dissolved in 0.01M Ca(NO₃)₂] in a range of 400 to 2000µg/L were applied to study the sorption amounts at 25(±2)°C and 45(±2)°C temperatures. With the increase in application rate and temperature, sorption amounts of Pb increased; however, percentages of sorption of applied Pb were decreased. Sorptions were positively and significantly (p≤0.01) correlated with Langmuir adsorption isotherm. Thermodynamic parameters of sorption (i.e. K_o, ΔG_o, ΔH_o, and ΔS_o) were also determined at two temperatures, 25(±2)°C and 45(±2)°C. Increase in K_o with the increase in temperature indicated positive effect of temperature on Pb sorption. High absolute values of ΔG_o, and positive values of ΔH_o, and ΔS_o suggested that the sorption reaction was spontaneous and endothermic. Sorbed Pb were desorbed in Pb free 0.01M Ca(NO₃)₂ solutions at 25(±2)°C and 45(±2)°C. Desorption amounts increased with increase in the Pb application rate, but not always with the increase in temperature.

KEYWORDS

Desorption; Isotherm; Lead; Sorption, Thermodynamics

Cite this paper

 Dutta, S. and Singh, D. (2011) Sorption and desorption behavior of lead in four different soils of India. *Agricultural Sciences*, 2, 41-48. doi: 10.4236/as.2011.21007.

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