

Phosphorus Fractions and its Adsorption Thermodynamics onto Sediments from the Upper Reaches of the Yellow River, China

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Abstract

The form distribution of phosphorus (P) in ten surface sediments from the upper reaches of the Yellow River, China, was studied using the sequential chemical extraction procedure—the standards, measurements and testing harmonized procedure. The equilibrium and thermodynamics of P adsorption onto sediments were evaluated. Five fractions of sedimentary P, including metal oxide bound P (NaOH-P), calcium bound P (HCl-P), inorganic P (IP), organic P (OP) and concentrated HCl P (total P, TP), were separately quantified. The results indicated that the contents of different P fractions in sediments varied greatly. The mean of TP content was 657.57 mg/kg, and averages of NaOH-P, OP, HCl-P and IP contents represented 4.03%, 8.85%, 82.10% and 88.69% of TP, respectively. HCl-P was the major component of IP and TP. the amount of potential bioavailable P was approximately estimated 12.88% of TP. The equilibrium data of P adsorption on different sediments fitted perfectly for Langmuir and Freundlich models. the adsorption amounts of P decreased with increasing temperature. The negative values of thermodynamic parameters ΔG and ΔH indicated the spontaneous and exothermic nature of the sorption.