Phosphorus Sorption by Water Treatment Residuals: Kinetics and Mechanisms. (S11-makris102852-Oral)

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Abstract:

Many sandy soils are characterized by low amounts of Fe and/or Al (hydr) oxides, and correspondingly low P sorption capacities. The high amorphous Al or Fe content of drinking water treatment residuals (WTRs) would be expected to increase P sorption capacities of such soils. We studied the sorption capacity, kinetics, and mechanisms involved in the reaction of P with an iron-WTR from Tampa, FL. Sorption isotherms were conducted to identify P sorption maxima using initial P loads up to 10 g P/kg. Sorption kinetics were monitored by reacting the WTR with 0.01M KCl solutions containing different P concentrations for periods of 0.25 to 80d. Desorption experiments were sequentially conducted using the same background electrolyte and 5mM buffered oxalate solution. The P sorbing capacity of the WTR was 9 g P/kg after 80d, and data suggested that true equilibria had not been reached despite the prolonged reaction. Desorption experiments showed that minimal P (close to detection limit) was released into solution. In parallel, solution concentrations of iron decreased as more P was sorbed by the WTR. SEM-EDS analyses on WTR microtomes showed the inward P movement and partial transformation of the WTR particles. The huge P sorption and retention capacities of the WTR could justify their consideration as a best management practice to minimize P inputs to surface waters.

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