

PHOSPHORUS SORPTION AND RECOVERY: MAJOR CHALLENGES TO CLOSE THE PHOSPHORUS CYCLE

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Abstract

Phosphate rock and phosphorus are listed by the European Union as the critical raw materials due to the risks of their shortage of supply and the impacts of a shortage on the economy are greater than those of most other raw materials. Although, high concentration of P in surface waters is the leading cause of eutrophication, which is a serious environmental problem in many countries of the world. Eutrophication of both freshwater and coastal marine ecosystems leads to a decrease in oxygen concentration and increases the abundance of toxic algae and aquatic plants. Discharge of untreated or semi-treated wastewater into the environment is one of the main causes of eutrophication; therefore, it is necessary to use effective wastewater treatment methods. One of the possibilities for the removal of P from wastewater is the use of biomaterial sorbents modified by iron oxohydroxide, which is an alternative to traditional wastewater treatment methods. As a prospective solution for P removal from wastewaters peat and other biomaterials has been suggested and tested. The obtained sorbents characterize high sorption capacities, fast sorption and relatively high sorbent saturation capacities and possibilities to run sorption process both in static and dynamic conditions. The results showed that P can be efficiently removed from wastewater by modified biomaterial sorbents; furthermore, after the purification process sorbents saturated with P can be recycled and used as fertilizers in agriculture. The saturated sorbents can be composted and transformed to a high value fertilizer considering significant amounts of phosphorus as well as presence of iron and nitrogen compounds. Further tests using domestic wastewaters were done and the presence of metals as well as toxicity of the sorbents were tested, proving application prospects. Thus biomaterial based sorbents can be a feasible approach for phosphorus removal from wastewaters and return of nutrient for agricultural applications as well as reduction of phosphorus load to waters.

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