Hydrothermal synthesis of easy-recycled tobermorite/SiO$_2$/Fe$_3$O$_4$ composites for efficient treatment of phosphorus in wastewater

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ABSTRACT

In this work, tobermorite/SiO$_2$/Fe$_3$O$_4$ composites were designed and synthesized by hydrothermal method for the treatment of phosphorus in wastewater. The composites were characterized by scanning electron microscopy and X-ray diffraction. The removal efficiency of phosphorus on the tobermorite/SiO$_2$/Fe$_3$O$_4$ composites was carried out and investigated under various conditions, such as contact time, sorbent content, and pH. After the multi-run experiments, the phosphorous elimination of the tobermorite/SiO$_2$/Fe$_3$O$_4$ composites was declined slightly comparing with the first-run experiments. Compared with the conventional crystallization methods, tobermorite/SiO$_2$/Fe$_3$O$_4$ composites not only gave high efficiency to remove phosphorus from wastewater without any complicated pretreatment, but also provided excellent magnetic properties for separating the phosphorus from water, which made it easy recycled. Moreover, tobermorite/SiO$_2$/Fe$_3$O$_4$ composites had excellent P-elimination properties even in the strong acidic or basic conditions. Therefore, tobermorite/SiO$_2$/Fe$_3$O$_4$ composites were important candidate for water quality control and protection.

Keywords: Tobermorite/SiO$_2$/Fe$_3$O$_4$ composites; P-elimination; Easy recycled