Phosphorus removal from domestic sewage by adsorption combined photocatalytic reduction with red mud

Zhang Yi\textsuperscript{a,b}, Xia Shibina\textsuperscript{c}, Kou Dandan\textsuperscript{c}, Xu Dong\textsuperscript{a}, Kong Lingwei\textsuperscript{a,b}, He Feng\textsuperscript{a,*}, Wu Zhenbin\textsuperscript{a,*}

\textsuperscript{a}State Key Laboratory of Freshwater Ecology and Biotechnology, Institute of Hydrobiology, Chinese Academy of Sciences, Wuhan 430072, China
Emails: wuzb@ihb.ac.cn; hefeng@ihb.ac.cn
\textsuperscript{b}Department of Environmental Science and Engineering, Graduate University of Chinese Academy of Sciences, Beijing 100039, China
\textsuperscript{c}Department of Environmental Science and Engineering, School of Resources and Environmental Engineering, Wuhan University of Technology, Wuhan 430070, China

Received 9 September 2012; Accepted 21 December 2012

\textbf{ABSTRACT}

Phosphorus removal from domestic sewage by adsorption combined photocatalytic reduction with raw and modified red mud (RM) was studied in this paper. The results indicated that RM dosage, reaction time, stirring rate, phosphorus concentration, and initial pH of solution (pH\textsubscript{i}) were the main factors to effect on phosphorus removal. It was found that the phosphorus removal efficiency of modified red mud (RM-m) under the photocatalytic test conditions was higher than only by adsorption process, while raw red mud (RM-raw) showed no significant difference under the two conditions. With initial phosphorus concentration 8.26 mg/L, reaction time 60 min, stirring rate 200 r/min, under the adsorption and photocatalytic test conditions, the optimum dosage and pH\textsubscript{i} of both RM-raw and RM-m were 1.8 g/L and 4.0, respectively, and the corresponding phosphorus removal of RM-raw and RM-m were 90.18 and 91.70%, respectively. The optimum amount of RM-m under the two conditions were 1.6 and 1.5 g/L, respectively, the optimal pH\textsubscript{i} 3.0, correspondingly, the phosphorus removal could reach high up to 94.30 and 99.96%, respectively.

\textbf{Keywords:} Adsorption; Domestic sewage; Modification; Photocatalytic reduction; Phosphorus removal; Red mud