



## Preparation of coagulant from red mud and semi-product of polyaluminum chloride for removal of phosphate from water

Fan Ni, Xianjia Peng\*, Ying Zhao, Jinsong He, Yiran Li, Zhaokun Luan

*State Key Laboratory of Environmental Aquatic Chemistry, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, P.O. Box 2871, Beijing 100085, P.R. China  
Tel. +86-10-62849198; Fax: +86-10-62849198; email: xjpeng@rcees.ac.cn*

Received 7 March 2010; Accepted 2 November 2011

---

### ABSTRACT

Traditionally, calcium aluminate, caustic soda, lime or aluminum slag was employed as alkali for basicity adjustment in the production of polyaluminum chloride (PACl). In this work, red mud (RM), a highly alkaline waste from alumina industry, was utilized instead of the traditional alkali. A composite coagulant (RMPACl) was prepared from RM and the semi-product of polyaluminum chloride (ACl). Important factors for preparation, such as RM/ACl ratio, reaction temperature and reaction time, were investigated and optimized to be as follows: RM/ACl ratio of 0.25 (w v<sup>-1</sup>), reaction temperature of 80°C and reaction time of 4 h. The results of coagulation tests showed that RMPACl exhibited better performance than PACl for removal of phosphate. The optimum coagulation pH range of RMPACl was found to be 6.0–8.5. High phosphate removal efficiency (>94.9%) was achieved by dosing RMPACl at the dosage of 147.5 mg l<sup>-1</sup>. Therefore, RMPACl was considered as a low-cost coagulant, which possessed a good coagulation performance for removal of phosphate.

*Keywords:* Alkalinity; Composite coagulant; Red mud; Semi-product of polyaluminum chloride; Basicity; Phosphate removal

---

\*Corresponding author.