



Preparation of polymeric aluminum ferric silicate for the pre-treatment of oily wastewater through response surface method

Mengdan Tang^a, Yongjun Sun^{a,b,*}, Chengyu Zhu^a, Yanhua Xu^b, Huaili Zheng^c, Xuefeng Xiao^a, Wenquan Sun^a, Huifang Wu^a, Cuiyun Liu^a

^aCollege of Urban Construction, Nanjing Tech University, Nanjing, 211800, China, emails: sunyongjun008@163.com (Y. Sun), sunyongjun@njtech.edu.cn (Y. Sun), 935763168@qq.com (M. Tang), 2506885738@qq.com (C. Zhu), xuefengnjut@163.com (X. Xiao), coneflower@163.com (W. Sun), wuhuifang@163.com (H. Wu), yunduobai@126.com (C. Liu)

^bJiangsu Key Laboratory of Industrial Water-Conservation & Emission Reduction, College of Environmental Science and Engineering, Nanjing Tech University, Nanjing, 211800, China, email: yanhuaxu18@hotmail.com

^cKey laboratory of the Three Gorges Reservoir Region's Eco-Environment, State Ministry of Education, Chongqing University, Chongqing, 400045, China, email: zhl@cqu.edu.cn

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ABSTRACT

A new composite coagulant, polymeric aluminum ferric silicate (PAFSi), was prepared for the pre-treatment of oil-containing wastewater. The structure and morphology of PAFSi were investigated through X-ray diffraction, Fourier transform infrared spectroscopy, and scanning electron microscopy. Results revealed that PAFSi is a new complex multi-hydroxyl polymeric coagulant rather than a simple mixture of raw materials. Response surface method was applied to optimize the preparation process. Optimization performance was evaluated according to flocculation efficiency. The flocculation efficiency of PAFSi was determined by measuring the reduction in oil and chemical oxygen demand (COD). In addition, the parameters that affect flocculation efficiency, such as coagulant dosage and oily wastewater initial pH, were examined. Compared with polymeric aluminum ferric sulfate (PAFS), PAFSi exhibited superior flocculation performance, with maximum oil removal efficiency of 96.9% and maximum COD removal efficiency of 95.4% at a dosage of 25 mg·L⁻¹ and pH of 7. PAFSi exhibited better flocculation ability than PAFS.

Keywords: Composite coagulant; Coagulation; Response surface methodology; Oily wastewater; Oil removal

* Corresponding author.