Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2012.749329

51 (2013) 2687–2694
March

Taylor & Francis
Taylor & Francis Group

Electrolytic degradation of polyacrylamide in aqueous solution using a three-dimensional electrode reactor

Zhi-Hong Kang[a], Hong-Kai Li[a], Yao-Hui Xu[b,*], Lin Chen[a]

[a]*School of Energy Resources, China University of Geosciences, Beijing 100083, China*
[b]*Department of Geochemistry, Yangtze University, Nanhuan Road, Jingzhou 434023, China*
Tel./Fax: +86 716 8060406; email: yaohuixu@hotmail.com

Received 13 March 2012; Accepted 25 July 2012

ABSTRACT

In this study, electrochemical treatment of a synthetic solution containing 2,000 mg/L of polyacrylamide (PAM) was studied using a three-dimensional electrode reactor, which received granular activated carbon (GAC) as particle electrodes. Air and ferrous salt were introduced into the system to electrogenerate hydrogen peroxide and Fenton's reactions. The effect of operating conditions such as solution pH, current density, ferrous concentration and GAC amount on the efficacy of the process was investigated. The experimental results showed that the effluent with a satisfied chemical oxygen demand removal efficiency (84%) was obtained after 60 min of electrolysis when the initial pH was 3.0, current density was 40 mA/cm^2, air flow = 1.5 L/min, pH = 3, [Fe^{2+}] = 1.5 mM, and temperature = 28°C. The analyses of five-day biochemical oxygen demand and Microtox® toxicity indicated that the optimum electrolysis duration was 30 min, at which satisfied biodegradability of wastewater was achieved. The three-dimensional electrode method can be selected as an effective alternative to PAM wastewater pretreatment before subjected to the biological process.

Keywords: Fenton's reaction; Ferrous salt; Nitrate; Microtox® toxicity

*Corresponding author.