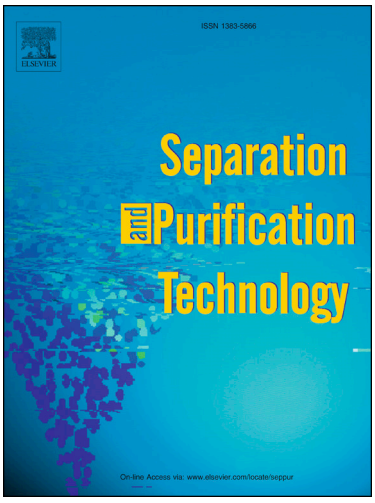

Cationic kraft lignin-acrylamide as a flocculant for clay suspensions: 1) molecular weight effect

Agha Hasan, Pedram Fatehi

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Cationic kraft lignin-acrylamide as a flocculant for clay suspensions: 1) molecular weight effect

Agha Hasan, Pedram Fatehi*

Chemical Engineering Department, Lakehead University, 955 Oliver Road, Thunder Bay, ON, Canada, P7B5E1

*Corresponding author, email: pfatehi@lakeheadu.ca; Tel: 807-343-8697; Fax: 807-346-7943

Abstract

Currently, kraft lignin is burned in the recovery cycle of the kraft pulping process; despite its high potential to be extracted and converted into value-added products. In this work, kraft lignin (KL) was copolymerized with acrylamide (AM) and 2-[(methacryloyloxy) ethyl] trimethylammonium chloride (DMC) to produce cationic copolymers. Copolymers with two different molecular weights of 168,200 g/mol (KAD-1) and 103,000 g/mol (KAD-2), but with a similar charge density of 1.15 meq/g, were selected and the flocculation efficiency of the copolymers in two different clay suspensions was investigated. Suspension pH affected the adsorption of the copolymers on clay particles and the removal of the particles from the suspension. At a 8 mg/g dosage, KAD-1 adsorbed more than KAD-2 as it was larger and thus developed more bridging with clay particles. The size of particles raised from 4.7 for kaolin to 16.3 μm for kaolin/KAD-1 flocs and 15.1 μm for kaolin/KAD-2 flocs, and it increased from 6.1 for bentonite to 18.97 μm for bentonite/KAD-1 flocs and 15.35 μm for bentonite/KAD-2 flocs in the presence of 8 mg/g of copolymers, respectively. The adsorption, zeta potential and flocculation analyses confirmed that KAD-1 was a more effective flocculant than KAD-2. The evidence for the agglomeration of clay particles via bridging and electrostatic patch mechanisms was also discussed in this work.