Accepted Manuscript

Polymer Reaction Engineering Tools to Design Multifunctional Polymer Flocculants

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PII: S0045-6535(18)31250-5

DOI: 10.1016/j.chemosphere.2018.06.175

Reference: CHEM 21707

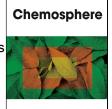
To appear in: Chemosphere

Received Date: 17 April 2018

Accepted Date: 28 June 2018

Please cite this article as: Sarang P. Gumfekar, João B. P. Soares, Polymer Reaction Engineering Tools to Design Multifunctional Polymer Flocculants, *Chemosphere* (2018), doi: 10.1016/j. chemosphere.2018.06.175

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ACCEPTED MANUSCRIPT

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6	
7	Abstract
8	A series of multifunctional terpolymers, poly(N-isopropyl acrylamide/2-(methacryloyloxy) ethyl
9	trimethyl ammonium chloride/N-tert-butylacrylamide) [P(NIPAM-MATMAC-BAAM)] were

designed to flocculate and dewater oil sands mature fine tailings (MFT). The hydrophobic BAAM 10 comonomer helped expel water out of the sediments, while the cationic MATMAC comonomer 11 promoted charge neutralization of the negatively-charged particles suspended in MFT. The 12 chemical composition distributions of these terpolymers were designed based on the knowledge 13 of the reactivity ratios of all comonomers, instead of by trial and error, as usually done for most 14 polymer flocculants. The binary reactivity ratios of the comonomers were estimated by 15 synthesizing the binary copolymers with varying mole fraction of each comonomer in the feed, 16 17 and experimentally measuring the corresponding fraction of comonomer in the copolymers. Polymer reaction engineering tools were used to minimize compositional drift and guarantee the 18 synthesis of terpolymers with narrow chemical composition distributions suited for MFT 19 dewatering. Focused beam reflectance measurement (FBRM) experiments showed that the 20 terpolymer promoted the formation of MFT large flocs (120 µm). The initial settling rate (ISR) 21 decreased with increasing flocculant hydrophobicity, likely because the hydrophobic terpolymer 22 segments did not take part in the bridging of the MFT particles. Contrarily, the sediments 23

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