

Effects of Chemical and Sulfate on Floc Characteristics for Treating AMD

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Abstract. Acid mine drainage treatment floc properties are important considerations in the design of treatment systems. Relatively few studies have evaluated the effects of neutralizing base, neutralization pH and sulfate in solution on floc physical properties in active treatment systems. We used NaOH and NH₄OH as neutralizing bases, 0:1, 2.5:1 and 5:1 sulfate-to-iron molar ratios, and neutralization pHs of 7, 8 and 9 in laboratory studies. Neutralizing cation, sulfate content and neutralization pH had significant effects on floc mass and volume, but sulfate ratio was the most important parameter. Settled floc volumes were slightly larger in the sodium system. Floc mass and volume both decreased with increasing pH. Floc generated in the presence of sulfate required significantly more time to reach a total suspended solids discharge limit of 70 mg L⁻¹, had slower initial settling rates and smaller settled volumes than floc generated without sulfate. We also investigated the potential for sulfate to interfere with arsenic sorption to precipitating floc. The systems we studied were less complicated than actual acid mine drainage, but understanding the main effects of sulfate, neutralizing cation and neutralization pH on the chemical and physical properties of floc may help to design more efficient treatment systems. Choosing the appropriate treatment chemical and designing adequate pond sizes will ultimately increase treatment efficiency and improve stream water quality.