The regrowth ability of alum–humic flocs: effect of polyacrylamide

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ABSTRACT

The effect of polyacrylamide (PAM) dosage and mixing time on the formation, breakage, and regrowth of alum flocs was explored by Mastersizer 2000. The result showed that the coagulation efficiency and regrowth ability of broken flocs were determined by the mixing time, PAM dosage, and pH value. When PAM was dosed simultaneously with alum, the broken flocs could not regrow, independent of PAM dosage, while the regrowth ability of broken flocs increased as the dosing time of PAM delayed. Broken flocs could fully regrow when PAM was dosed 5 min after the addition of alum. Both flocs' size and regrowth ability enhanced with the increase in PAM dosage when PAM was dosed 5 min or more later than alum. Although the size of alum-HA flocs could be slightly improved by PAM, the addition of PAM significantly improved both the growth ability of flocs and the regrowth ability of broken flocs at pH 7 and 8. This might be caused by the variation of chemical bonds with pH for PAM and alum precipitate. Scanning electron microscopic images proved that when PAM was dosed simultaneously with alum, PAM would be covered by alum-HA precipitate nanoparticles; but more PAM could be seen on the surface of flocs when PAM was dosed 6 min after the addition of alum. The variation of chemical bonds on the surface of precipitate primary nanoparticles may induce the irreversibility of broken flocs. The hydrogen bonding between PAM and alum-HA flocs may be the main flocculation mechanism for the high growth of flocs and regrowth of broken flocs.

Keywords: Coagulation; PAM; Hydrogen bonding; Breakage and regrowth

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