



Sweep flocculation as a second form of charge neutralisation—a review

Djamel Ghernaout^{a,*}, Badiaa Ghernaout^b

^aChemical Engineering Department, Saad Dahlab University of Blida, Blida 09000, Algeria
Tel. +213 (25) 43 36 31; Fax: +213 (25) 43 36 31; email: djamel_andalus@yahoo.fr

^bMechanical Engineering Department, Amar Tlidi University of Laghouat, Laghouat 03000, Algeria

Received 30 July 2010; Accepted 24 November 2011

ABSTRACT

The coagulation/flocculation (C/F) processes are mainly due to charge neutralisation (CN) and *sweep* flocculation (SF) mechanisms. However, the SF mechanism has also its CN property moreover than its well-known weighting characteristic. On this weighting characteristic, the literature has usually focused without taking in consideration the SF's CN property. This review discusses the implicated mechanisms in destabilisation of colloids and aggregation of flocs. Colloids are very small particles that have extremely large surface area. The consequence of this smallness in size and mass and largeness in surface area is that in colloidal suspensions: gravitational effects are negligible and surface phenomena predominate. Hence, during C/F process, colloids are removed by CN and SF mechanisms which act on the anionic charge of the colloid by its neutralisation prior to its removal by sedimentation/filtration. The *sweep* flocs can be described as large aggregates of $\text{Al}(\text{OH})_3/\text{Fe}(\text{OH})_3$ that are formed when Al/Fe salt is added to water. Further, *sweep* flocs are positively charged and the colloids of clay minerals abundantly found in the water are negatively charged. As a result, the colloidal particles are electrostatically attached to the *sweep* flocs in the neutral pH water as to the hydrolysed metallic cations. Even if researches have greatly elucidated the growth, breaking and the re-growth of flocs, further research is required to understand CN and SF mechanisms and optimise the C/F process at the nano level.

Keywords: Coagulation/flocculation (C/F); Colloid; *Sweep flocculation* (SF); Charge neutralisation (CN); Mechanism; Aluminium; Iron

*Corresponding author.