

Algae and cyanotoxins removal by coagulation/flocculation: A review

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ABSTRACT

A continuing worldwide problem for drinking water treatment industry is the presence of algae in source water. Algae in drinking water supply can cause significant disturbances including taste and odour, production of disinfection by-product, obstruction to coagulation, clogging of filter, and assimilable organic carbon for growth of biofilm. Algae removal by conventional treatment is more difficult than inorganic particle, due to their low specific density, motility, morphological characteristics and negative surface charge. This review examines the character of freshwater algal populations and their algogenic organic matter from a coagulation/flocculation (C/F) perspective and reviews C/F for their removal. It was suggested that the coagulation mechanism was "one of mutual attraction and charge neutralisation (CN) of the algae and the incipient hydroxide floculi" and as such the hydroxide precipitant should be positively charged. It was observed that on adjusting the zeta potential of an algal suspension with a specific operational range, removal was significantly improved. However, it has been demonstrated that the impact of some algal characteristics means removal by CN mechanism is unfeasible. Removal by CN can be obtained if the algal cell is spherical, free from protruding appendages or polymeric substances and microscopic in size. Deviation from this optimum conformation is common among algae cells and hence the optimum removal conditions cannot always be predicted by charge measurement data. In many instances, even increasing the coagulant dose to enable removal by sweep flocculation mechanism does not improve removal. However, successful clarification relied heavily on the optimisation of preceding C/F and coagulant demand was important in this respect.

Keywords: Algae; Cyanotoxins; Natural organic matter; Coagulation; Flocculation; Water treatment

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