

ABSTRACT

This dissertation thesis focuses on the removability of algal organic matter (AOM) by coagulation during water treatment and also on the influence of AOM on the coagulation of other substances present in source water. Special emphasis is put on the description of coagulation mechanisms.

The effectiveness of AOM removal by coagulation was investigated by coagulation tests performed with optimized doses of coagulants (aluminium or ferric sulphate) under different pH values. Peptides and proteins contained in cellular organic matter of cyanobacterium *Microcystis aeruginosa* were used in the experiments since they have been previously reported to disturb the coagulation process. Moreover, peptides and proteins underwent coagulation experiments together with kaolin particles, representing clay particles in turbid waters, in both the presence and absence of coagulants to investigate the effect of AOM on the coagulation of turbid waters. To enable the description of coagulation mechanisms, AOM were characterised in terms of charge, functional groups, molecular weight and ability to form dissolved complexes with coagulant metals.

The experimental results demonstrated that the removability of peptides and proteins is greatly dependent on pH value and on the properties of the involved particles or molecules. The highest removal rates were achieved at such pH values, at which coagulants form positively charged hydroxopolymers that interact with negatively charged functional groups of peptides and proteins (pH 5 - 6.5 for aluminium and 4 - 6 for ferric coagulant). Similar results were achieved in the case of experiments with peptides and proteins and kaolin particles, during which amphoteric peptides and proteins interacted with both kaolin and coagulant hydroxopolymers, and peptides and proteins were shown to contribute to the coagulation of kaolin particles. The negative impact of peptides and proteins on the coagulation by formation of complexes with coagulants was observed, though at a narrow pH range (about 6.8 for Al and 6 for Fe). Furthermore, it was shown that high-molecular weight (MW) proteins (MW > 10 kDa) are easily removable by coagulation, whereas adsorption onto activated carbon is appropriate for the removal of low-MW peptides.

To conclude, coagulation was shown to be effective in removing high-MW AOM under optimised reaction conditions, and to be a useful pre-treatment step before technologies that are able to remove low-MW organic compounds.