Geophysical Research Abstracts
Vol. 21, EGU2019-14331, 2019
EGU General Assembly 2019
© Author(s) 2019. CC Attribution 4.0 license.

Coagulating different fractions of algal organic matter

Katerina Novotna, Lenka Cermakova, and Martin Pivokonsky
Institute of Hydrodynamics of The Czech Academy of Sciences, Pod Patankou 30/5, 166 12 Prague 6, Czech Republic

Removal of undesirable algal organic matter (AOM) is of growing concern for drinking water treatment plants worldwide. This study investigates coagulation of different AOM fractions, i.e. AOM peptides-proteins and non-proteinaceous compounds. Coagulation conditions were optimized for each fraction separately (with using Al2(SO4)3·18 H_2O as a coagulant) and the results were compared. Initial concentration of AOM was set to 5 mg/L DOC (dissolved organic carbon) for all the coagulation experiments. While good removal efficiencies (up to approximately 80%) were obtained for peptides-proteins by relatively low doses of coagulant (corresponding to 2 mg/L Al), non-proteinaceous fraction appeared to be difficult to coagulate (efficiency not exceeding 25%), even at high doses of coagulant (15 mg/L Al). Optimal coagulation pH (at which maximum AOM removal was obtained and residual Al concentrations were the lowest) also differed (pH values of 5.2-6.7 and 7.1-7.5 for peptides-proteins and non-proteinaceous fraction, respectively), which points out to the employment of different coagulation mechanisms. Also pre-hydrolyzed coagulant (polyaluminium chloride) was tested for coagulation of non-proteinaceous fraction, however, the efficiency did not increase and the optimum pH was shifted to even higher values (7.6-8.0). Additionally, both the AOM fractions were subjected to characterization in terms of their molecular weight (MW) and charge. These properties are important from the perspective of coagulation and contribute to elucidate its mechanisms. Moreover, the proportion of carbohydrates was determined in non-proteinaceous fraction. In general, low-MW compounds were less amenable to coagulation and their high content in non-proteinaceous matter (about 70% under 3 kDa) was among the reasons for its low removal. By contrast, high-MW proteins and high-MW carbohydrates were completely removed by coagulation.
To conclude, the results imply that the AOM character significantly influence the process of coagulation in water treatment and that specific AOM fractions, reluctant to coagulate, require involvement of other treatment processes to avoid their detrimental effects on drinking water quality.