Abstract

Many drinking water treatment facilities face problems with algal organic matter (AOM) due to eutrophication of the environment and frequent occurrence of algal blooms. AOM can cause deterioration of water organoleptic properties, but the main threat is the potential for acting as a precursor of toxic disinfection by-products (DBPs). The presented master thesis deals with the possibility of using electrocoagulation (EC) – an innovative electrochemical method – to remove cellular organic matter (COM) produced by cyanobacteria Microcystis aeruginosa from drinking water. EC is similar to widely used chemical coagulation, the difference is that during EC the coagulant is produced by electrochemical dissolution of an iron or an aluminum electrode. Synthetic water with COM concentration of 5.5 and 8.5 mg/L of TOC was used for the experiments. The target value of conductivity (4.5 mS/cm) was reached by addition of NaCl. pH of the solution was adjusted by HCl and NaOH. During some of the experiments, $NaHCO_3$ was added to increase the $ANC_{4.5}$. The experiments were conducted in a batch mode with a stainless-steel cathode and an aluminum or an iron anode. The coagulant dosage was regulated by applied electric current passing through the electrodes. Flocs were separated by sedimentation and centrifugation. COM concentration was measured as TOC value. Concentrations of dosed and residual metal ions were analyzed by ICP-OES. It was confirmed that the reaction pathway and the efficacy of COM removal strongly depends on pH and the type and amount of the applied coagulant. Solution conductivity, initial COM concentration, $ANC_{4.5}$ value and flocs separation method were also important. The highest achieved TOC removal efficacy under optimized conditions (aluminum anode, initial pH 6.5, Al dose 6 mg/L) was 43 %. The concentration of residual Al was 0.15 mg/L, remaining well under the official limit for drinking water (0.2 mg/L). According to the results of the experiments, EC appears as a promising alternative to the commonly used chemical coagulation and it deserves further attention.