ABSTRACT

The dissertation thesis focuses on the application of activated carbon for the removal of low molecular weight algal organic matter (AOM) produced by phytoplankton during drinking water treatment, as well as on the effect of AOM on adsorption of anthropogenic micropollutants contained in raw water. The results of this study have been published in international peer-reviewed journals in 4 papers and in 2 conference contributions.

The efficiency of AOM removal was studied in laboratory equilibrium and kinetic experiments using different types of granular activated carbon and cellular peptides with molecular weight < 10 kDa produced by cyanobacterium *Microcystis aeruginosa*. It has been previously confirmed that these peptides are removed with difficulty during the conventional water treatment based on coagulation/flocculation processes and therefore, other methods need to be applied for their restriction. The effect of solution properties on peptide adsorption was assessed by the tests at different pH values and at variable ionic strengths. The negative impact of peptides on the adsorption of organic micropollutants present in raw water was simulated using competitive adsorption experiments with herbicides alachlor and terbuthylazine and fresh activated carbons and carbons preloaded with cellular peptides.

The experimental results proved that activated carbon can be an effective adsorbent for natural and anthropogenic organic pollutants in case of properly designed adsorption conditions. Adsorption efficiency depends strongly on solution pH value, which affects both the protonation/deprotonation of pollutants' functional groups and surface charge of activated carbon. The amount of adsorbed peptides markedly increases with the decrease of pH value to acidic region (from pH 8.5 to pH 5) and with the increasing portion of secondary micropores and mesopores in activated carbon structure. Moreover, adsorption is significantly affected by the solution ionic strength, which can enhance or reduce peptide removal through the influence on electrostatic interactions in adsorption system. The effect of ionic strength depends on the pH value and the type of activated carbon. Among COM peptides, those with molecular weights below 4.5 kDa were removed preferentially and had negative effect on the removal of both herbicides owing to the competitive adsorption. This was apparent mainly at acidic pH value (pH 5) and thus corresponded well to higher adsorption of peptides under such conditions.