

Abstract

This diploma thesis deals with the study of adsorption of low-molecular components of organic substances produced by phytoplankton - AOM (Algal Organic Matter) on AC (Activated Carbon) during drinking water treatment. For the experimental purpose in this thesis, there were used selected amino acids as low molecular substances of AOM that are difficult to remove by conventional water treatment process by coagulation. As adsorbent, there was used a detailed characterized of granulated activated carbon (GAC) - Filtrasorb TL 830 (FTL830) which is intended directly for the purpose of water treatment. There were realizing the equilibrium batch adsorption experiments with three different model amino acids - arginine (Arg), phenylalanine (Phe) and aspartic acid (Asp). There was investigated the efficiency of removing amino acid depending on the solution temperature and pH. Results of the adsorption experiments have shown that the temperature affects the adsorption efficiency. Adsorption is essentially described as an exothermic process but the adsorption of Arg and Phe from an aqueous solution to GAC occurs more efficiently at higher temperatures. It means that the adsorption is the endothermic process. In the case of Arg adsorption, the temperature was found to influence adsorption efficiency less than the pH. The highest efficiency was achieved at the highest investigated area of temperature 25°C and pH 9. Under these conditions, the molecules of Arg were positively charged and the surface of GAC was negatively charged, that means there were positive electrostatic interactions. Higher temperature supported the diffusion of molecules and reduced the viscosity. That led to an increase in adsorption efficiency. Different results were found in Phe adsorption. The highest adsorption efficiency was achieved at the same temperature 25°C but at pH 5. The main mechanism of adsorption of Phe is not electrostatic interactions but a hydrophobic effect that took place greater at the higher temperature of the solution. In the case of Asp adsorption, the influence of temperature and pH was found insignificant. The reason might be the hydrophilic nature of this amino acid by which the substances remains dissolved in the aqueous in solution.

Key words

Adsorption, Algal organic matter (AOM), Amino acid, Granular activated carbon (GAC), Temperature, Thermodynamic, Water treatment