ABSTRACT

This diploma thesis deals with the efficiency and factors affecting the adsorption of AOM (Algal Organic Matter) amino acids (AAs) arginine (Arg), phenylalanine (Phe) and aspartic acid (Asp) onto granular activated carbon (GAC) Picabiol 12x40 (PIC). The efficiency of AOM AAs removal was studied in laboratory equilibrium and kinetic experiments and it was shown that the adsorption efficiency of the selected AAs is dependent on the structure of the molecule of AAs and the nature of the functional groups of their side chain, and more particularly to solution pH, which determines the nature and size and surface charge of AAs and GAC. In contrast to this, the ionic strength (IS) of solution had relatively low effect on the AAs adsorption. Arg adsorption efficiency increased with increasing pH and reached a maximum at pH 9, where AAs and GAC were oppositely charged, and this leads to attractive electrostatic interactions. In the case of Asp adsorption on PIC practically did not work. The reason is that under all experimental conditions Asp molecules and the surface of the PIC carried identical negative charge. This led to the strong electrostatic repulsion between Asp and PIC which prevented effective adsorption. In the case of Phe the adsorption decreases with increasing pH. Maximum adsorption efficiency of Phe was achieved at pH 5. The electrostatic interactions were also determined as the main adsorption mechanism of Phe onto PIC. On the other hand, the adsorption of Phe was enhanced by hydrophobic interaction, that appear mainly at higher initial concentrations of the adsorbate. Generally, it can be stated that the adsorbed amount increases with increasing initial concentration of AOM AAs in the solution. Effect of the IS on efficiency of AAs adsorption was observed mainly for Arg, when efficiency of adsorption decreases with increasing values of the IS. Increasing the ionic strength from 0,01 to 0,3 M caused a screening of the electrostatic attractive force and a decrease of the adsorption efficiency of about 50%. In the case of Phe and Asp the influence of the IS was not approved on the adsorption.

Keywords

Adsorption; algal organic matter (AOM – Algal Organic Matter); arginine; phenylalanine; aspartic acid; granular activated carbon (GAC – Granular Activated Carbon).