Research on hydrophilicity and hydrophobicity of adsorption of NOM on metal oxide/water interface

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\textbf{ABSTRACT}

Natural organic matter, consisting of 40–60% of humic substances of which the main ingredient is humic acid (HA), is ubiquitous in natural water systems. It poses a potential threat to a water treatment system. Metal oxides in the form of minerals in water are usually considered as carriers of HA. The main adsorption mechanisms of HA on metal oxides have been electrostatic interaction, ligand exchange, hydrophobic interaction, etc.; however, few researches have done on hydrophobic interaction. Therefore, the goals of this study were to investigate the hydrophobic interaction of HA-Fe\textsubscript{2}O\textsubscript{3} complexes and the functional groups of HA under various solution conditions, which can give us a better understanding of the adsorption mechanism. Results showed that the thermal weight loss of HA-Fe\textsubscript{2}O\textsubscript{3} complex, which indicated its hydrophilicity and hydrophobicity, changed regularly when the pH value was varying and the ionic strength maintained constant. While the ionic strength was changing and the pH value maintained constant, the weight loss showed a fluctuating trend. FTIR spectra indicated that the HA functional groups, of which the combined effect finally played a significant role in hydrophilicity and hydrophobicity of HA-Fe\textsubscript{2}O\textsubscript{3} complex, might be hydrophilic hydroxyl (OH), carbonyl (C=O), and hydrophobic alkane (CH\textsubscript{2}). The change trend of HA adsorption amount with solution conditions coincided with that of weight loss of HA-Fe\textsubscript{2}O\textsubscript{3} complex, which testified that hydrophobic interaction did affect the adsorption of HA on metal oxides.

\textbf{Keywords:} Adsorption; Functional groups; Fe\textsubscript{2}O\textsubscript{3} nanoparticles; Humic acid; Hydrophilicity and hydrophobicity; Solution conditions

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