Environmental Science Graduate Program Seminar Series

Impact of Natural Organic Matter Properties on Competitive Adsorption by Powdered Activated Carbon

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Abstract

Natural organic matter (NOM) is a mixture of organic compounds ubiquitous in natural aquatic and terrestrial environments. Adsorption is a common method that used for contaminants removal during water treatment process. As an adsorbent, powdered activated carbon (PAC) is widely used for intermittent issues such as harmful algal blooms. The presence of NOM can negatively affect the adsorption efficiency of target contaminants such as microcystin, one of the most common algal toxins in aquatic systems. Some studies indicated that NOM have competitive adsorption with other compounds on PAC. The adsorption of NOM on PAC can be affected by PAC properties such as pore size distribution and surface area, and physical properties of NOM such as molecular weight. NOM can occupy the adsorption sites on surface of PAC particle and block the PAC pores. However, different components of NOM can also react with various functional groups on PAC, suggesting that the chemical composition or properties of NOM can be important to adsorption on PAC. In this study, the adsorption of NOM to PAC was studied for a range of NOM and PAC types to understand how NOM composition and PAC properties affect the adsorption. NOM kinetic experiments with four types of PAC and individual isotherm experiments were conducted to determine the best condition of the adsorption experiment. The results showed that NOM adsorption varied via PAC types and PAC concentration. The next step of this study is to evaluate how variable components of NOM affect the adsorption to PAC. Fourier transform ion cyclotron resonance mass spectrometry and ultraviolet-visible spectroscopy will be used to collect NOM composition information.