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Completed Graduate Theses

Rosario F. 2006. Characterization of the Polarity of Natural Organic Matter in Water. PhD dissertation, UCLA

Abstract:
The study of natural organic matter (NOM) is of extreme importance in many areas of science and engineering. The effects of this ubiquitous material include the fate and transport of contaminants, carbon balance in the ecosystem, and formation of disinfection by-products. All of these processes are affected by the specific chemical and physical characteristics of NOM, making characterization of NOM necessary. One of the main parameters of interest in NOM research is the characterization of the polarity of this material. Ideally, characterization would be performed under natural conditions, while minimizing any sample pre-treatment. In reality, however, this is a difficult goal due to the complexities of NOM. The work presented in this dissertation includes the development of a new polarity methodology for the characterization of NOM, which focuses on the minimization of sample modifications. The NOM polarity rapid assessment method (PRAM) allows the characterization of the polarity of NOM with the use of solid-phase extraction (SPE). Each SPE cartridge consists of different functional groups, which allow the multi-dimensional characterization of the polarity of NOM. The use of this technique allows the characterization of NOM without the need to pre-concentrate or modify the sample. A series of organic probes combined with physiochemical calculations were used to understand retention by each SPE sorbent used. Strong trends were found between retention by non-polar SPE sorbents and hydrophobic properties. This method was used to characterize the changes in polarity of NOM through two treatment systems, conventional and ozone/biofiltration, during the course of six weeks. We observed differences in polarity between all samples, as well as differences in the changes through both treatment processes. The observed differences support the need for continuous monitoring of NOM, which the presented polarity method allows with minimum effort. Finally, the NOM at the Lake Mead system in Southern Nevada was studied by a combination of the polarity method with size exclusion chromatography and fluorescence spectroscopy. The overall results indicate that the NOM has different origins, ranging from terrestrial to autochthonous organic matter. Multi-dimensional studies like this one allow a deeper understanding of NOM nature and reactivity.

Wang KJ. 2005. Characterization of humic substances and non-ideal phenanthrene sorption as affected by clay-humic interactions. Ph.D. dissertation, University of Massachusetts, Amherst.