Binding characterization of organic microcontaminants to CTABr micelles to predict micellar-enhanced ultrafiltration treatment of wastewater


a Department of Chemistry, Queen’s University at Kingston, Kingston, ON, Canada, K7L 3N6
b Water Science and Technology Directorate, Environment Canada, 867 Lakeshore Road, Burlington, ON, Canada, L7R 4A6

Abstract: Micellar enhanced ultrafiltration (MEUF) has been shown to be an effective removal technique for a variety of trace contaminants in wastewater, especially for water soluble low molecular weight organic contaminants. In MEUF, contaminants first partition into surfactant micelles prior to removal by ultrafiltration, where the contaminants are below the molecular weight cut-off of the ultrafiltration membrane but the micelles are above the cut-off. We previously examined the removal efficiency of MEUF for sulfonamide antibiotics with Cetyltrimethylammonium bromide (CTABr) using a semi equilibrium dialysis method to determine binding constants for the antibiotics. We have since extended the binding constant measurements to polycyclic aromatic hydrocarbons (PAHs) including phenanthrene, naphthalene, pyrene and fluorene. Unlike the antibiotics, where charge-charge interactions determined binding to CTABr micelles, the neutral PAHs show strong binding with CTABr because of hydrophobic interactions. Our results enabled us to develop a relationship between binding constant (logK_B) and logK_OW for neutral compounds, which will be useful for predicting MEUF performance for PAHs removal from waste water.