The Effect if Biomass on the Measured Solubility of Priority Contaminants in Aqueous Bioremediation Systems *

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Biodegradation is used for many organics that are only sparingly soluble in water. One critical parameter necessary for predictive design in these remediation systems is the availability of the organic compound in the aqueous environment where the active enzyme or microbe is present. Due to the difficulty of obtaining real-system solubility measurements, environmental models have generally used solubility constants of chemicals in pure water or, in a few rare cases, simple linear models to predict biomass-influenced solubility. Here, we present experimental data for various solubility parameters (e.g., H, Kow, for sparingly soluble organics such as alkanes and chloroorganics) measured in high-density aqueous biomass typical of the biofilms used in bioremediation effots. We have found that the presence of biological material can increase effective solubilities by an order of magnitude; therefore, the previous simple approaches are not valid and are extremely poor predictors of actual bio-influenced partitioning. The solubility of propane, for example, is five times higher in a dense aqueous biofilm than in pure water. This change is nonlinear but can be fitted. We will present solubility values for a variety of conditions and contaminants and discuss the impact this solubility effect has on bioconversion modeling.

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