Changes in the Effective Aqueous Solubility of TCE in the Presence of Biomass

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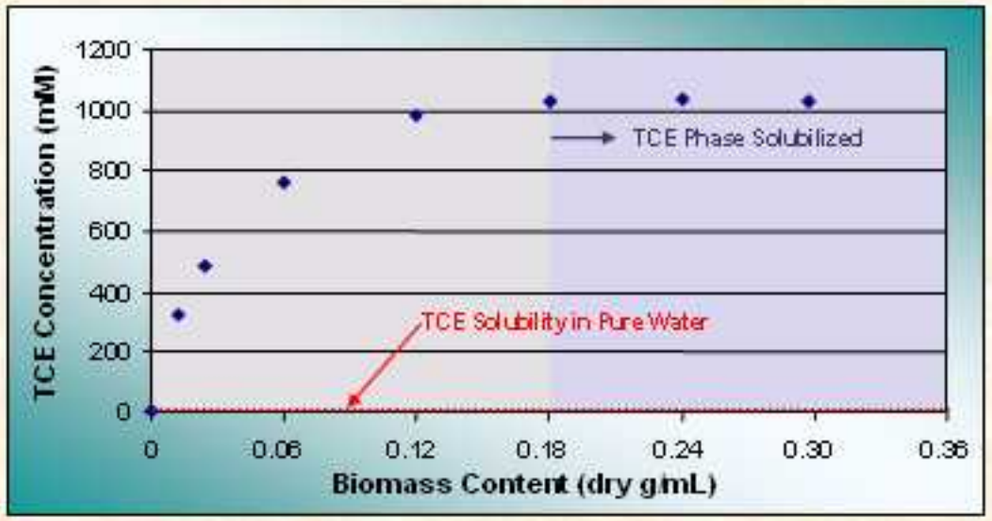
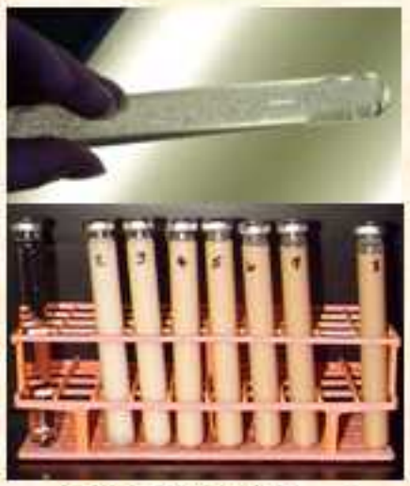
Even though biological material can impact the effective solubility of several chemicals, fundamental partitioning and solubility data of sparingly soluble subsurface contaminants (e.g., TCE, Benzene, etc.) have rarely been collected for systems other those containing pure water and/or air/octanol. In this work we have shown that

- TCE solubility can be more than two orders of magnitude higher in aqueous solutions containing biomass (whole yeast cells were used). This result is particularly relevant for environmental clean-up activities since TCE is the nation's most common groundwater contaminant, and is practically insoluble in pure water.
- Predictive models and management planning must consider background biomass levels (e.g., bacterial counts, fungal loads) at TCE-contaminated sites.
- A similar two-order-of-magnitude effect was measured for the TCE partitioning constant between air and water phases containing biomass (this parameter is often referred to as the Henry's Law constant).
- Large solubility changes in water were noted even when relatively low levels of biomass were present





An aqueous phase containing varying amounts of whole cell biomass (in the form of yeast) was contacted with a constant volume of TCE; the volume ratio was 13:1. As the biomass concentration was raised, the TCE phase gradually disappeared until only one phase was present, which then had a constant TCE concentration. TCE in all phases was measured and accounted for, allowing for closure of the TCE mass balance.

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