

Coal Tar Recovery from former Manufactured Gas Plant Sites Using Single-Phase Microemulsion

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Background/Objectives. Coal tar is a common source of soil contamination on the former manufactured gas plant sites. Conventional pump and treat methods rely on low aqueous solubility of coal tar in water for remediation, which makes the remediation process slow and highly inefficient. Use of surfactants to improve the solubility of coal tar in aqueous phase has been suggested in the literature. We propose an alternative method of soil remediation that relies on the application of single phase microemulsion to achieve extremely high tar solubilization (up to 500,000 mg/L). The process will significantly reduce pore volumes injected and time required for remediation.

Approach/Activities. Phase behavior experiments such as surfactant screening, salinity scans and aqueous stability tests were conducted focusing on achieving single phase microemulsions. Microemulsion solutions were analyzed using GC-MS to ensure no preferential solubilization of lighter components. Selected surfactant formulation was used in a flow experiment to study the dynamic behavior of produced microemulsion.

Results/Lessons Learned. Surfactant screening experiments showed that a blend of sulfate (propoxysulfate) and sulfonate (sulfosuccinate) surfactants has the potential to achieve high solubilization. Solubilization parameter was improved by alkali addition in order to generate in situ surfactants. Single phase microemulsion was achieved with a mixture of sulfate and sulfonate (1:1) with alkali (sodium carbonate). Flow experiment with above mentioned formulation resulted in production of single phase microemulsion of low viscosity (< 100 cP) with low pressure drop. Recovery of 73% of the coal tar contaminant was achieved after 30 PV injection. Experiments are on-going for more efficient surfactant formulations. Surfactant can be recovered from the produced microemulsion and recycled for re-injection, making the process very economical. Various surfactant recovery methods are being studied to find the most suitable one for the process.