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ACCEPTED MANUSCRIPT

Enhanced solubility of trichloroethylene (TCE) by a poly-oxyethylene alcohol as green surfactant

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Abstract

In this paper we tested a commercially available synthetic fatty alcohol ethoxylated surfactant (synperonic 91/5, SYN), known to be a low-impact and biodegradable *green* surfactant, to improve the aqueous solubility of trichloroethylene (TCE). The alcohol is a non-ionic surfactant that easily forms O/W emulsions and it can emulsify several oils, waxes and solvents and it is also used as a wetting agent in a wide variety of applications, its biocompatibility and biodegradability have been tested in several conditions both in pharmaceutical and environmental fields. We measured the critical micelle concentration of the surfactant by means of the pyrene method; the dissolution of TCE into water solutions at increasing [SYN] was investigated by means of UV-VIS technique and the solubilisation performances were evaluated in terms of WSR (Weight Solubilisation Ratio) and MSR (Molar Solubilisation Ratio). Finally, the dependence of TCE solubility upon temperature variation was also assessed. In the microemulsion regime the solubility of TCE was found to increase up to fifteen times with respect to pure water at 20 °C, corresponding to a MSR of about 0.21. The MSR was found to increase at lower temperatures up to 0.24 at 4 °C. Synperonic can thus be applied for TCE remediation from soils and groundwaters by taking advantage of techniques such as pump and treat and enhanced surfactant flushing.

Keywords: Trichloroethylene, Green Surfactant, surfactant co-solvent flushing,

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