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Trichloroethylene (TCE) is a halogenated aliphatic organic compound frequently detected as pollutant in soils and ground
water.

A multidisciplinary approach is often required to remediate TCE polluted sites and this PhD thesis faces this problem blending together three main topics, namely surfactant co-solvent flushing, phytoremediation and catalytic oxidation, to develop an effective remediation strategy.

First of all we studied the diffusion mechanism of TCE in water to improve the models employed to describe the fate of the pollutant in the groundwater. In particular, we measured for the first time, the diffusion coefficient of TCE in water ($8.16 \pm 0.06 \times 10^{-6}$ cm^2s^{-1}). Moreover, we tested a commercially available, low-impact and biodegradable green surfactant, namely Synperonic 91/5 (Syn 91/5), to enhance the aqueous solubility of trichloroethylene. The results showed that Syn 91/5 allowed to increase up to 15 times the TCE aqueous solubility. The aim of this part of the work is to improve surfactant co-solvent flushing technology using eco-compatible and low cost surfactants.

In a later stage, we investigated the use of the plant *Zea mays* L. for the removal of high TCE concentrations from a growing medium, intended to be a laboratory model for soils and water phytoremediation. In previous works, Mays plants were successfully used for the phytoextraction of heavy metals contaminated sites. The idea was to exploit the phytoremediation capability of *Z. mays* for the remediation of TCE polluted sites. The results showed that in 9 days of exposition, the plant was able to metabolize TCE with an efficiency ranging from 15 to 20 %, depending on the total amount of the pollutant added in the system.

Finally, we investigated a new green material to be used as catalyst for the total oxidation of TCE. Mayenite (C12A7) is a low cost material recently employed as active catalyst for several reactions. In this project we demonstrated that mayenite is able to oxidize TCE with better performances with respect to zeolites and other traditional catalysts. In particular, mayenite promoted the total oxidation of TCE in the temperature range 250-500° C, and the pollutant was converted in less harmful products such as CO_2, CO and HCl.