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Solubilization of Soil-bound PAHs by Mixtures of Surfactant Solutions.

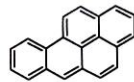
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INTRODUCTION

The aim of this work is to enhance the efficiency of biological remediation process by using surfactant. Indeed the efficiency of such process is often limited by the availability of pollutants due to their low aqueous solubility and their hydrophobic character resulting in a strong interaction with the organic matters in soils.



Benzo(a)Pyrene
B(a)P

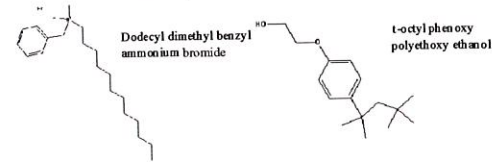
MATERIAL AND METHODS

Soil of manufactured gas plant site (Rouen, France) :

- HAPs : 3000 ppm
- others pollutants : Cyanides, Fe, Al

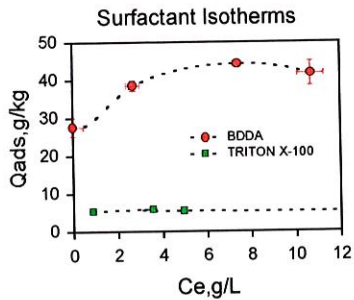
Batches with soil suspensions : Csol = 200 g/L

HPLC Analysis : - 16 PAHs
 - BDDA, Triton X-100.

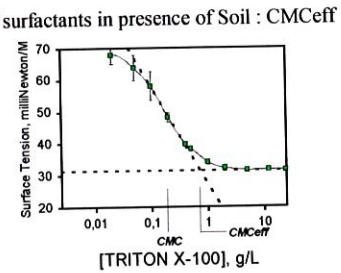
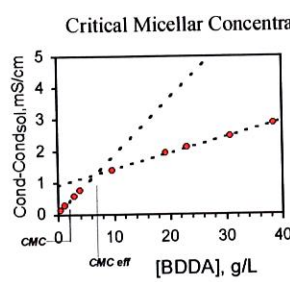


RESULTS

Interactions Soil/Surfactant :

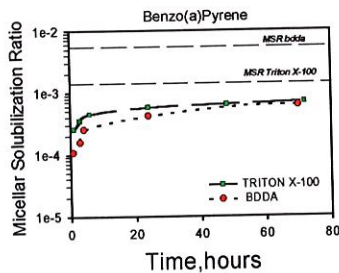


Adsorption : BDDA > TRITON X-100



CMC eff > CMC
 Solubilization of HAPs occurred when C surf > CMC eff

Release of Benzo(a)Pyrene :



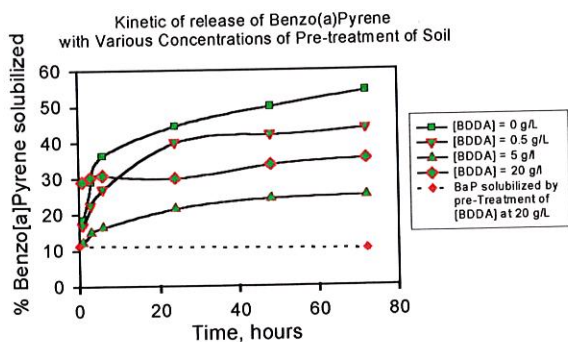
Molecular Solubilization Ratio (MSR) : The number of mole of PAH solubilized per mole of surfactant in micellar phase.

MSR values in pure water : BDDA : $5,5 \cdot 10^{-3}$
 Triton X-100 : $1,5 \cdot 10^{-3}$

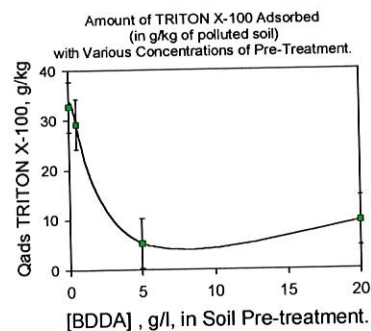
In soil suspensions : MSR BDDA # MSR Triton X-100
 Two Surfactants are equivalent in term of both efficiency and kinetic.

Influence of soil/PAHs/surfactant interactions on the efficiency of the release of Benzo(a)Pyrene :

Pre-treatment of soil by BDDA and release of Benzo(a)Pyrene by Triton X-100.



Decrease of the efficiency of Triton X-100 to release B(a)P with the pre-treatment of soil by BDDA.



Decrease of the Triton X-100 adsorption with the pre-treatment of soil by BDDA.

CONCLUSION

- The soil/B(a)P/BDDA interactions decreased the adsorption of Triton X-100 on the polluted soil and the efficiency of Triton X-100 to release the Benzo(a)Pyrene. BDDA adsorption enhanced the retention of B(a)P.
- Antagonistic effect of Surfactants is shown : If ρ = Mass of B(a)P Solubilized/Total mass of Surfactant, ρ values are : $2,0 \cdot 10^{-4}$ with [Triton X-100] = 60 g/L alone, $1,9 \cdot 10^{-4}$ with [BDDA] = 20 g/L alone and $1,1 \cdot 10^{-4}$ with the mixture of BDDA (20 g/L) and Triton X-100 (60 g/L).
- Influence of a pre-treatment of soil by Triton X-100 on the further desorption of PAHs by BDDA will be evaluate.