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INVESTIGATION OF NANOPARTICLES AS POTENTIAL ACTIVATORS FOR THE OPTIMIZATION OF PAH BIODEGRADATION

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Abstract

These last decades, through the industrial development and its imperfect waste management, the contamination by hydrocarbons in water and soils has led to a progressive deterioration of environmental quality, which is more and more considered nowadays. Amongst all the existing cleaning-up techniques, the bioremediation appears as the best compromise between treatment costs and effectiveness. However, this bioprocess remains time-consuming, especially for persistent pollutants as PAHs (Polycyclic Aromatic Hydrocarbons).

A first way to improve the biodegradation consists in adding a consortium of efficient microorganisms in the polluted area (bioaugmentation). A further way to improve the bioremediation rate is based on the use of nutrients to assist the microbial metabolism (biostimulation). Our project gathers these two methods, specifically for the PAH biodegradation of polluted soils. Firstly, different suitable strains from our lab will be compared together in terms of PAH-degrading rate, in order to select the best microorganisms. As all these strains were selected from a long-term oil-polluted dried soil, they should be able to compete against the endogenous microflora, even if they are injected in the soil in a powdered starter. Secondly, trace elements in the nanoparticulate form, with concentrations of about 10^{-5} M, will be added to catalyze the bacterial metabolism. First results already showed a sharp increase (2 to 3 fold) in the biodegradation kinetics, which is promising for the further scaling-up stages. In addition, this PhD project attempts to understand the mechanism of interaction between bacteria and nanoparticulate catalysts.
