



INFLUENCE OF THE NITROGEN SOURCE AND SURFACTANTS ON THE DEGRADATION OF PETROLEUM HYDROCARBONS IN SOIL CONTAMINATED

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Introduction. The biostimulation, is a technique used in the treatment of soils contaminated with petroleum hydrocarbons, is based on the use of nutrient solutions, such that facilitate the degradation of the contaminant (1). The nutrient is the most widely used nitrogen, which require the microorganisms to synthesize enzymes, proteins, and nucleic acids (2), in addition the use of surfactants is very important due to that increase the solubilization and mobilization of the contaminant (3), facilitating their degradation.

In light of the foregoing, it would be of special interest to evaluate the effect of the nitrogen source along with the addition of surfactants on the biological remediation, reason of the present work.

Methods. There was a Physicochemical characterization of the soil as a compendium of techniques suggested by the Mexican Institute of Petroleum and other (4). The work was developed in two phases, in the first, were evaluated six levels of nitrogen concentration (C/N ratio, 100/3, 100/5, 100/7, 100/10, 100/13, 100/15) of solutions $\text{CO}(\text{NH}_2)_2$, $(\text{NH}_4)_2\text{SO}_4$, NH_4NO_3 . In the second phase, were evaluated three concentration levels (0.5, 1, 1.5 CMC solutions, SDS, Triton X-100 and glycerol, in both phases were determined total petroleum hydrocarbons (4).

Results. The Physicochemical characterization of the contaminated soil is shown in table 1. At the end of the treatment, in phase 1 were achieved maximum removal rates up to a 30.84 % using urea as a source of nitrogen, whereas with the treatments with $(\text{NH}_4)_2\text{SO}_4$, and NH_4NO_3 removals were achieved maximum of 10.30 % and 8.58 %, respectively, as can be seen in figure 1.

Table 1. Physicochemical Characterization of the soil.

PARAMETER	RESULT
Texture	Sandy-clayey
pH	7.34
Total nitrogen	0.05%
Total petroleum hydrocarbons	70880.47mg/Kg

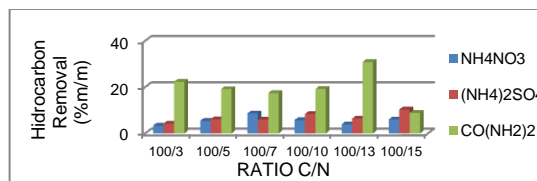


Fig. 1: Percentage of hydrocarbon removal with the different sources of nitrogen

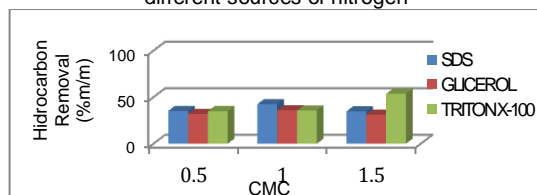


Fig. 2: Percentage of hydrocarbon removal with different surfactants

In phase two, rates were highest for remediation 53.66 % arising as a result of the treatment with triton X-100 at a concentration of 1.5 CMC, this is up to 10% and 20% higher in relation to the SDS and glycerol, respectively, not holding that proportion to concentrations of 1 and 0.5 CMC, as can be seen in figure 2.

Conclusions. With the addition of urea as a source of nitrogen to the concentration used it is possible to reduce the levels of pollution present in the soil, this can be attributed to the urea is more easily assimilated by the microorganisms when you use it to their functions. In addition to the foregoing, the addition of a surfactant with the properties of the Triton X-100, that to be of non-ionic type facilitates the solubilization of contaminant, the potential for bioremediation.

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References.

1. Baheri, H. y Meysami, P. (2002). *J. of Haz. Mat.* 89 (3): 279-286
2. Gruiz, K. y Kriston, E. (1995) *J. of Soil Cont.* 4(2): 163-173.
3. Yu, H., Zhu, L. and Zhou, W. (2007). *J. of Haz. Mat.* 142(5): 354-365.
4. *Manual de técnicas de análisis de suelos aplicadas a la remediación de sitios contaminados*, Instituto Mexicano del Petróleo, Secretaría de Medio Ambiente y Recursos Naturales, Instituto Nacional de Ecología México, D. F., 2006.