

## Evaluation of Bioremediation Process in 10 Api Crude Oil.

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### Introduction and Aim.

Bioremediation tests were conducted for 90 days in a sandy loam soil contaminated with extra heavy crude oil (10 API), in order to analyze the changes in biomarkers of the saturated hydrocarbon fraction. The oil used is of complex composition, is biodegraded and appears to represent a mixture of crude oils with different biodegradation level (presence of n-alkanes, pristane, phytane and 25-norhopanes). Using this type of oil is more realistic in a bioremediation test, as the results obtained allow a closer interpretation of what can be found in oil spills and oil pit wastes, which generally are oil mixtures of different origins and/or biodegradation levels.

### Materials and Method.

In aliquots of 10 g of soil extraction was performed with dichloromethane, and in residual soil TOC was determined. In the oil extracted for 90 days and original oil, the saturated hydrocarbon fraction was separated by liquid chromatography and analyzed by GC-MS through the interpretation of the ions  $m/z = 113$  (n-alkanes, pristane and phytane), 191 (terpanes), 177 (25-norhopanes), 217 and 218 (steranes) to determine the effect of biodegradation. The equipment used was a gas chromatograph Agilent Technologies 6890N Network DCSytem model coupled to a MS mass spectrometer Agilent 5973 Network Mass Selective Detector.

### Results.

During bioremediation there is no 25-norhopanes formation. However, the order of biodegradation observed for homohopanes is: C35>C34C32>C31. This alteration can

proceed by a route different from homohopanes desmethylation. Moreover, the change in the distribution pattern of homohopanes (R + S) after bioremediation indicates more alteration of C32 and C35 and a selective biodegradation of C3322S homohopane epimer. Tricyclic terpanes alteration is suggested by the variation in signal intensity when comparing the original oil with the one after bioremediation during 90 days. The steranes do not have a specific order of alteration after 90 days; however, the signal intensities suggest a decrease in their concentration.

### Conclusions.

The molecular biodegradation order observed after bioremediation is: loss of alkanes < n-C25, unchanged > n-C25, pristane and phytane, and alteration of tricyclic terpanes, homohopanes and steranes.