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THE IMPLICATION OF PETROLEUM CONTAMINANTS IN SIMULATED OIL-SPILL-IMPACTED SOILS

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With the increasing demand for petroleum, more and more crude oils have been exploited, at the same time the petroleum-associated environmental problems were becoming more and more serious. Oil spills can take place during the processes of petroleum exploration/exploitation, transportation, refinery, utilization and storage. The petroleum contaminants have been detected from soils, sediments, water and air; from the coastal zones, canals, and even from the cold regions such as Alaska, USA; and in fact almost from everywhere.

This work was aimed to probe the interaction between oil spills and soils by continuous Soxhlet extraction with increasing polarity solvents (*n*-Hexane, Acetone, Chloroform and Methanol), to study the formation patterns of different fractions of petroleum contaminants in soils. Then 3 studied soils (MM, GS and SD) and one crude oil (HY, from Shengli oilfield, China) were used to simulate the interaction between petroleum contaminants and soils, in addition that two other outdoor petroleum-contaminated soils were studied for comparison. The background TOC data of the soils studied (822.5, 33.8 and 55.0ppm based on the dry soil weight for MM, GS and SD samples, respectively), associated with their mineral compositions can divide them into different classes. Their saturates and aromatics distributions were shown in Fig.1. Then 0.5346, 0.5441 and 0.5439 gram of crude oil HY were added into MM, GS and SD soils (50 grams for each), respectively. The blended samples were fully stirred to make the simulated oils completely dispersed into the soils, and then put aside in the dark for 72 hrs, which were afterwards used for the continuous Soxhlet extraction and subjected to different kinds of analysis procedures.

The experimental results indicated that the saturated hydrocarbons were mainly randomly scattered in soils independent of the nature of different soils, while the aromatics were found having different adsorption/desorption properties depending on different soils, and the other polar compounds from petroleum contaminants showed different formation patterns. These results indicated that stronger interaction forces have been formed between the aromatics and the soils, which may be through π-π, π-M^+ (metal ions from the minerals in soils) or H-bonding interactions variable with the soil nature. And even stronger interaction,

such as chemical adsorption or even chemical bonding, has taken place between the polar compounds from the petroleum contaminants and soils, which can even make the polar contaminants to be mineralised into the soils. This work indicated that different technologies should be considered for the remediation of oil spills with respect to the different fractions of petroleum contaminants, as well as that the soil nature should be taken into account.

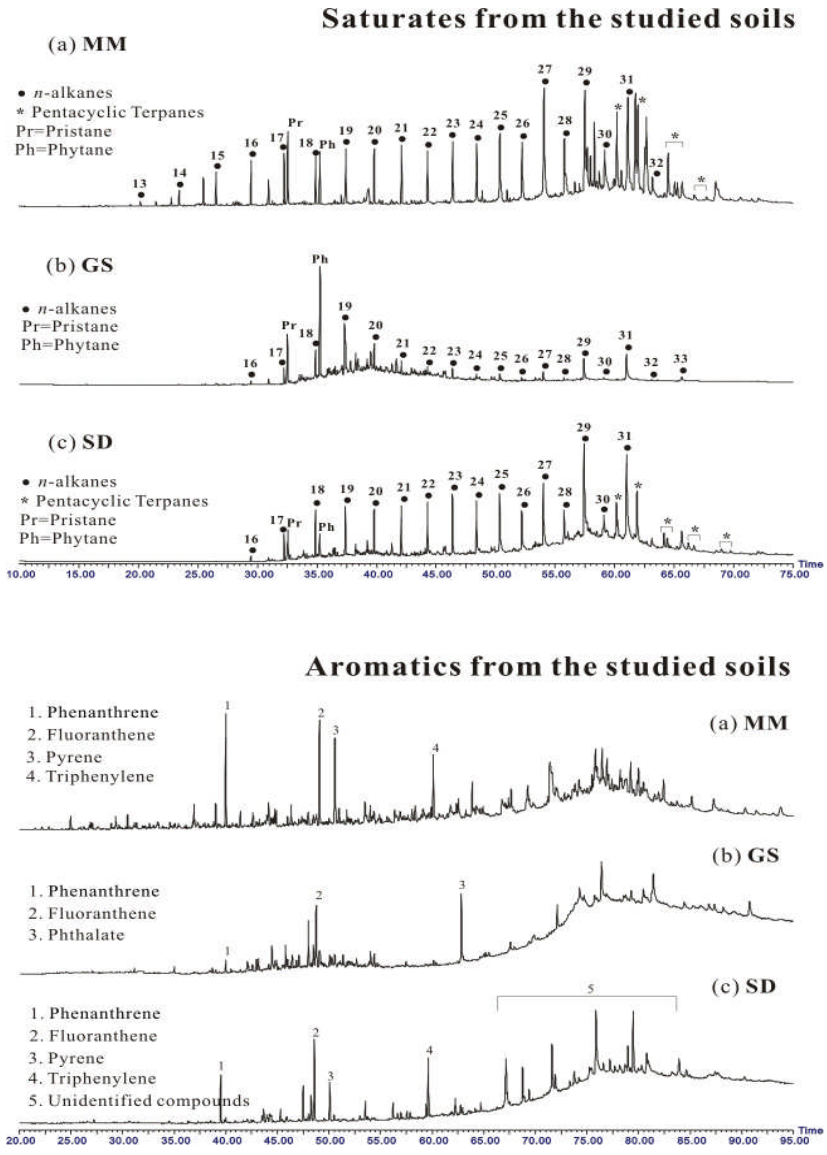

Figure 1. Chromatograms of saturates and aromatics from the studied soils. (a) MM soil; (b) GS soil; (c) SD soil.