Revisiting Chemical Mechanisms Of Petroleum Generation In Sedimentary Basins : Role Of Asphaltenes During Kerogen Cracking

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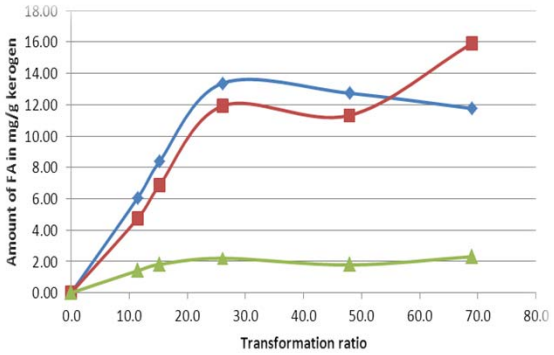
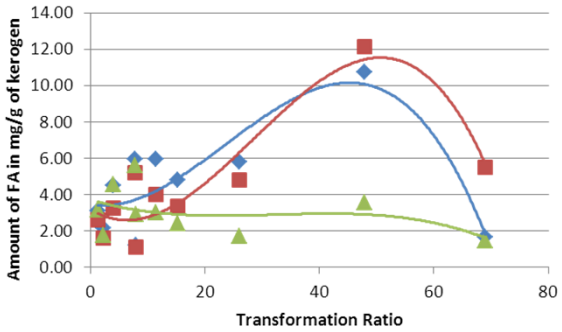
Our aim is to identify the major chemical mechanism for petroleum formation. It consists on comparing the chemical structures of NSO's generated in simulations of petroleum formation with the chemical structure of their precursor kerogen and the chemical structure of the hydrocarbons formed with a molecular-scale specificity that has not been possible before.

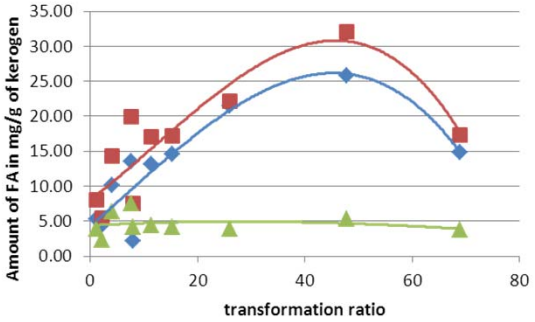
n-pentane extract

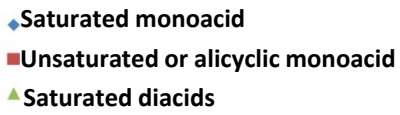


DCM extract



n-pentane + DCM extracts





The series $C_nH_{2n}O_2$, $C_nH_{2n-2}O_2$, $C_nH_{2n-2}O_4$, and $C_nH_{2n-10}O_2$, all correspond to carboxylic acid-containing compounds, are the major components of the NSO's generated in closed system pyrolysis of a type I kerogen from the Mahogany Zone of the Green River Formation. Therefore we proposed that decarboxylation of these carboxylic acid-containing compounds is responsible for the generation of hydrocarbons found in petroleum. By calibrating the FTICR-MS with internal standard, it was possible to assign a response factor for the mono-carboxylic acids and dicarboxylic acids, and consequently get a quantification of the total mono- and di-carboxylic acids contents.

Figures show the evolution of the proportion of these carboxylic acid compounds in the NSOs produced during lab simulation of kerogen maturation. Different trends of carboxylic acid production are observed for the two types of NSOs: *n*-pentane and DCM soluble. The whole (from the *n*-pentane and DCM extracts) quantitative proportions of these carboxylic acids compounds in the NSOs are then compared to the proportion of hydrocarbon produced.