

## **U, Th and Pb systematics in petroleum systems: first analyzes of petroleum source rocks by fs-LA-ICP-MS**

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For the first time, a Femtosecond Laser Ablation system (high ablation rates) coupled with ICPMS was developed for accurate Pb, U and Th chemical and isotopic determinations in petroleum source rocks. This technique, producing trace elements and isotopic analysis of source rocks, has been principally used to assess the timing of expulsion of crude oils with the system U-Th-Pb.

We measured the Pb, U, Th chemical ratios of crude oils and kerogens from source rocks from different regions in the world. Because kerogen pellets are heterogeneous (organic matter, sulfurs), the use of the laser ablation has allowed to analyze punctual parts of the organic molecules. Conventional dissolution of the same pellets gives an average value of the isotopic lead ratios and U, Th and Pb concentrations of the bulk sample. The combination of crude oils and source rocks isotopic lead values from the same basin allows the determination of an expulsion age of the hydrocarbons and the measurement of U/Th ratios of source rocks allows accessing the type of sedimentary environment.

So, according to the analytical method (mineralization of kerogen directly analyzed on MC-ICP-MS, or laser ablation coupled with Quad ICPMS or with a MC-ICP-MS for kerogen pellets), different informations have been obtained using the Th, U, Pb system: depositional environment, concentrations and isotopic lead signature for dating crude oils, characterization of lead sources (mantle contribution, anthropic lead). This gives innovative new constraints for the modeling of petroleum systems.

## **Global geochemical baseline mapping for environmental management in India**

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India has been an active participant in international efforts of the IUGS/IAGC Task Group on Global Geochemical Baselines that have a long-term goal of producing a global geochemical database. A project based on global baselines norms was initiated in India by National Geophysical Research Institute to cover the entire country consisting of 122 GRNs of 160 x 160 sq. kms. Geochemical baselines are required in order to document the present state of earth's surface environment against which any future changes due to anthropogenic activities can be measured. Baseline data can also provide basic information for environmental remediation.

As part of Global Baselines, studies have been carried out to prepare geochemical baseline maps for India. Samples from top and bottom soil were collected and studied in 117 out of the 122 GRN cells in India. The sampling was carried out as per the guidelines given in the 'Green Book' field manual. The samples were processed and analyzed for 28 major and trace elements by X-ray fluorescence spectrometer. Geochemical maps have been prepared showing the distribution of different elements in India. The maps are useful to know the distribution of some of the toxic metals, which are known hazardous to human health and eco-system. Geochemical maps have been produced and spatial correlations are being found between the underlying geology and element abundances in the sampled media. The hot spots for the toxic metals can be seen at a glance for the whole country, which will help in taking suitable remedial measures.