

## Molecular distribution and stable carbon isotope compositions of gasoline hydrocarbons in associated condensates from gas reservoir to characterize oil-cracking gas and kerogen thermal degraded gas

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Classic composition and isotope techniques are the most powerful tools to identify natural gas genetic types. However, it is still problematic and difficulties to differentiate oil-cracking gas from kerogen-cracking gas. In this presentation, we developed new parameters from gasoline hydrocarbons in associated condensates from gas reservoir to characterize oil-cracking gas and kerogen thermal degraded gas.

The gasoline hydrocarbons are the important middle products during the thermal degradation of sedimentary organic matter, and ultimately to methane and graphite with increasing temperature in deep Earth. Theoretically, gasoline hydrocarbons from kerogen are directly degraded from macromolecular network and will migrate out of the source rock via generation and expulsion once hydrocarbon concentration reaches up to the saturated threshold of rock, whereas gasoline hydrocarbons from oil-cracking are formed via C-C bond cleavage of high molecular weight compounds, cyclization and aromatization, and involved an isotopic kinetic fractionation, although they will be destroyed under very high temperature. In such a way, gasoline hydrocarbons in condensates from oil-cracking gas reservoir should be characterized not only by highly relative concentrations, but also by the <sup>13</sup>C enrichments of cycloalkanes and monoaromatics, suggesting that molecular distribution and stable carbon isotope compositions of gasoline hydrocarbons can be a measure to characterize oil-cracking gas and kerogen thermal degraded gas. Following this idea, parameters based on the relative concentrations of trimethylbenzenes in the range of gasoline hydrocarbons were constructed. Combined with the measurements on stable carbon isotopic compositions of cyclohexane, methylcyclohexane and toluene, a case study from Chinese petroliferous basins was presented.

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## Geochemical modelling of fluid-rock interaction during acid ISL uranium mining in SHT Uranium Deposit, NW-China

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The SHT Sandstone-type Uranium Deposit is located in a desert area, NW-China, and is characterized by highly mineralized Cl-SO<sub>4</sub>-Na type water with TDS ranging from 8g/L to 12g/L in the ore-containing aquifer. The typical hydrochemistry of the groundwater is given in Table 1.

Species	pH	U	K <sup>+</sup>	Na <sup>+</sup>	Ca <sup>2+</sup>
Con.	7.0	2.2	21.2	2033.0	752.0
Species	Mg <sup>2+</sup>	HCO <sub>3</sub> <sup>-</sup>	CO <sub>3</sub> <sup>2-</sup>	SO <sub>4</sub> <sup>2-</sup>	Cl <sup>-</sup>
Con.	365.0	481.0	0.0	3150.0	3370.0

**Table 1:** Hydrochemistry of groundwater in SHT Deposit (Concentration expressed in mgL<sup>-1</sup>)

The mean CaO content of uranium ores is around 0.8%, and the CaO concentration of calcareous sandstone partings varies from 4.48% to 14.36% in the ore-containing sandstone-conglomerate strata.

In order to develop a suitable ISL uranium mining system, geochemical modeling on fluid-rock interaction has been made. Geochemical simulation shows that the saturation indexes of carbonate and gypsum in the groundwater are positive indicating sulphate and carbonate minerals are saturated with water. The variation of saturation index of gypsum and dissolution of calcite caused by sulphuric acid acidification of the groundwater are also simulated. The result suggests that the SI values of gypsum increases with decreasing pH of water, and that the SI values of calcite decreases with decreasing pH of water.

The study implies that the acid ISL mining system should not be applied in the deposit due to the chemical plugging which will be caused by the precipitation of gypsum.

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