

## **Influence of Radioactive Element and Radioactivity on Hydrocarbon Generation of Source Rocks**

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Organic-inorganic interaction has always played an important role during source rock formation and hydrocarbon accumulation. This study chooses uranium, which is rich in Chinese basins as representative radioactive element to explore effects of radioactive element on hydrocarbon generation. Uranium (UO<sub>2</sub>CO<sub>3</sub> solution) was added to low-maturity sources respectively containing kerogen I, II, and III in hydrocarbon generation simulation experiments by using autoclave. The experimental results show that: ①uranium can increase the gaseous hydrocarbon production rate and yields, and promote the conversion from unsaturated to saturated hydrocarbons, the fracture of long chain hydrocarbons and the production of low molecular weight hydrocarbons; ② uranium can increase the degree of isomerization of the olefins, make the molecules of the olefins formed more dense in the crystal lattice, and promote the conversion from olefins to saturated alkanes from 350°C; ③uranium can increase the maturity and reduce the hydrocarbon generation threshold of source rocks; ④uranium can prevent organic matter from over-maturing at high temperature, which is beneficial to hydrocarbon formation and the preservation.

After the hydrocarbon generation simulation experiments of source rocks with uranium, we also conduct separate simulation experiments for radioactivity ( $\gamma$ -ray from cobalt) on a series of samples (n-decane, bitumen, salt solution, oil field water, water, etc.) to study the hydrogen generation (the impact of exogenous hydrogen on hydrocarbon generation is huge) from different fluids under radiation. The results are shown as follows: ①all hydrogen-containing substances can produce hydrogen under  $\gamma$ -ray irradiation; ②different salt ions have different effects on the amount of hydrogen generated by radiation; ③hydrogen production increases with the rising radiation intensity; ④abundant hydrogen, a small amount of methane and carbon dioxide are produced from n-decane, kerogen and bitumen by radiation.

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