

## **Oil-source correlation study in Kuche depression of Tarim Basin using nitrogen, sulfur and oxygen-containing compounds**

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There are six groups of potential hydrocarbon source layers in the Jurassic and Triassic of Kuche depression, Tarim Basin. Among them, T<sub>1-2k</sub>, T<sub>3h</sub> and J<sub>2q</sub> are dominated by lacustrine mudstones, and the other three layers are coal bearing sediments. The coal-measure source rock has obvious geological color effect in the process of hydrocarbon expulsion, which is not suitable to use biomarkers to analyze its oil source. In addition, in the case of multi-stage reservoir formation, there is a multi-resolution in the use of biomarkers indicators for oil-source correlation.

In this paper, Fourier transform ion cyclotron resonance mass spectrometry (FT-ICR MS) is used. Its one-time detection of crude oil or rock extracts can obtain the distribution of thousands of compounds rich in nitrogen, sulfur, oxygen, which provides an opportunity for the correlation study of oil and source. Combined with simulation experiments of hydrocarbon generation and expulsion of low maturity source rocks, a set of new geochemical indicators that can be used to identify the hydrocarbon source and maturity of oil are explored, which greatly improves the accuracy of oil-source correlation. The results show that the relative content of N,S,O-containing compounds in different source rocks is different. Heteroatom compounds with strong thermal stability, little influence on migration and unique characteristics, such as N,S,O trigonometric graph and  $N_xO_y/O_xS_y$ , can be used as indicators of oil-source correlation. While, compounds, such as  $N_x/N_xO_y$ , N<sub>1</sub>-DBE, which are greatly affected by migration fractionation, can be used as indicators to determine the direction of crude oil migration. In addition, the DBE peak distributions of N<sub>1</sub>,S,O-containing compounds in crude oil from different source rocks are also significantly different. According to the differences of N,S,O compounds, the sources of oils from several reservoirs in Kuche depression is analyzed, and the application effect is good.