ORGANIC GEOCHEMISTRY OF PETROLEUM IN DABEI-DAWANQI DISTRICT OF KUQA DEPRESSION NW CHINA: INSIGHT FROM NATURAL GAS AND LIGHT HYDROCARBONS

H Ji[1, 2], S.M. Li[1, 2], G.H. Huang[3]

[1] State Key Laboratory of Petroleum Resource and Prospecting, China University of Petroleum, Beijing 102249, China
[2] College of Geosciences, China University of Petroleum, Beijing 102249, China
[3] School of Resources and Environment, Yantze University, Wuhan, Hubei 430100 China
([*] Corresponding author: jihong-cup@outlook.com)

Characterized with abundant light hydrocarbons and natural gas, Dabei-Dawanqi district is an important oil and gas production area in northwest Kelasu structural belt of Kuqa depression, NW China. However, the deficiency research of geochemical features for the hydrocarbons of this area has deeply imped its exploration. In this regard, the carbon isotope data and chromatography methods were adopted to analyze the natural gas and light hydrocarbon component respectively for discussing their geochemical characteristics, which are expected to provide some information to the further oil and gas exploration in this area.

The results show that the natural gas of the study area is mainly composed of methane, with relatively lower amount of C^{2+} and CO_2 component. The dry coefficient of northern and deeper area of Dabei is much higher than that of southern shallow buried Dawanqi section with an average of 0.97. The dry coefficient of Dawanqi area is much complicated, for the aquifer gas zone shows similar features with Dabei area, with the average of 0.95, while without aquifer gas zones such as DW105 and DW109 block reveal relatively low dry coefficient with an average of 0.72, indicating solution gas features. Carbon isotopes ratios in methane ($\delta^{13}C_1$) of northern Dabei area range from -34‰~-30‰ with an average of -32.5‰, and the carbon isotopes of ethane ($\delta^{13}C_2$) distribute between -25‰~-20‰ with an average of 22.7‰. Most of the samples in Dawanqi area showed similar features, with an average ratio of -32.7‰ and 23.1‰ in $\delta^{13}C_1$ and $\delta^{13}C_2$ respectively, suggesting typical coal-type gas characteristics. However, exceptional abnormal sample exhibits such as DW 101, shows some oil-type gas features with very low ratio of $\delta^{13}C_2$ ($\delta^{13}C_2$=-30.8‰). we assume it may result from the mixed source rocks. The previous research (Dai, et al., 2004) suggest that the maturity of natural gas can be speculated according to the difference of $\delta^{13}C_2$-$\delta^{13}C_1$ as the ratio of $\delta^{13}C_1$ increases along with the maturity. The dry coefficient ratios and difference of $\delta^{13}C_2$-$\delta^{13}C_1$ in northern Dabei area display higher than that of southern Dawanqi area, indicating the maturity of natural gas in northern part is much higher than southern section.

The light hydrocarbon component of Dabei-Dawanqi district reveals with relatively low amount of n-alkanes but abundant aromatic hydrocarbons in benzene and toluene, suggesting terrestrial oils from higher plant input. The C_6, C_7 distribution and methylcyclohexane index reveal the terrestrial oils that stem from humic type organic matters. Genetic parameters of C_6, C_7 such as N_1^6/N_2 vs. P2/P3 and cyclopentane and cyclohexane show higher value of northern blocks such as Dabei and DW1 and west DW 105 block. Combined with its molecular biomarker analysis (Yang, et al., 2016), we assume that the oil and gas charging mainly come

from northern and west directions. The parameter of K1 proposed by Mango shows well conformed to the kinetic of the steady-state catalytic hypothesis(Mango, 1990) indicating the consistency of genetics. Heptane and isoheptane value imply the oil belongs to maturity stage, which is also proved by the Ro (0.8%-0.93%) converted with the light hydrocarbon generation temperature. The oils have gone through several mild alterations including biodegradation, evaporating and water-washing based on the analysis of light hydrocarbons including aromaticity index/alkane amount, 2-MP/3-MP and 2-MH/3-MH.

References

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