

Study on the source and origin of condensate oil in southern margin of Junggar Basin

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The middle section of Southern Margin in Junggar basin has five sets of source rocks, meantime, normal crude oil, light oil, condensate oil, waxy oil, heavy oil and abundant natural gases are also developed in many anticline structures. It has long been a hot debate of the source of oil and gas in this area. The results of this study demonstrate, condensate oil from the middle section contains abundant isoprenoid alkanes, with Pr/Ph<1.0. $\delta^{13}\text{C}$ of whole oil is low between -27‰ ~ -28‰ . $\delta^{13}\text{C}$ of alkanes with carbon number smaller than 9 ranges from -24‰ to -26‰ , $\delta^{13}\text{C}$ of C_{9+} alkanes decreases remarkably with increasing carbon number, and the $\delta^{13}\text{C}$ of C_{19+} alkanes is lower than -30‰ . The $\delta^{13}\text{C}$ of pristane and phytane is lower than -29‰ . The biomarker component contains abundant C_{27} sterane and C_{30} methyl sterane, "V" shape distribution of C_{27} , C_{28} and C_{29} sterane, abundant tricyclic terpane with dominance of C_{21} , and relatively high level of gammacerane with two isomers. The 20S/(20S+20R) value of C_{29} sterane is between 0.40~0.50, and the maturity determined according to the methylphenanthrene index and distribution fraction calculation (Rc) is between 0.70%~1.1%. These geochemical characteristics of condensate oils are very similar to those typical Cretaceous mature lacustrine crude oils in the middle section, but differentiate greatly from those typical Jurassic crude oils, implying that these condensate oils come from mature Cretaceous lacustrine source rocks instead of highly mature Jurassic coal-measures. In addition, condensate oil in the middle section is dominated by alkanes with low carbon number. They contain abundant aromatic carbon with low carbon numbers such as cycloalkane, methylbenzene and dimethylbenzene. Heptane number is between 19%~21%, isoheptane value is at 1.9~2.1 and methylbenzene/n-heptane ratio is between 1.5~2.0. The distribution of its alkane is in mirror-image relation to the waxy oil with high density and heavy oil, which means it is the product of early stage oil reservoir crude oil after suffering natural gas invasion at later stage and is the condensate oil formed under the fractionation of evaporation/phase migration.