The heavy oil accumulation characteristics and exploration potential of Orinoco heavy oil belt in East Venezuela Basin

LIU YA MING

Research Institute of Petroleum Exploration and Development, Petrochina, Beijing, China
(*correspondence: liuyaming-hw@petrochina.com.cn)

The parte knowledge of no exploration needed in Orinoco heavy oil belt is popular. In fact its resource isn't distributed omnipresent, and the accumulation recognition need to be enhanced. Based on the theory of hydrocarbon accumulation, the heavy oil accumulation conditions and characteristics of Orinoco heavy oil belt are analyzed, and the exploration direction is pointed out in this paper.

Orinoco heavy oil belt is located in the foreland slope region with weak structural affection. The main source rocks are the neritic mudstone of upper Cretaceous Guayuta group, with a thickness of more than 500m, rich in organic matter (TOC weight of 0.25-6.6%)and high hydrocarbon potential. The main reservoirs are the Delta sandstones of Oficina formation in Miocene and the Merecure formation in Oligocene, sandstones distributed widely in the shape of sheet, reservoir thickness keep stable on the east-west direction, and thinning to the south gradually. The reservoir capability is excellent for shallow burial(200-2000m, average of 900m), high porosity(10-32%, average of 21%), and high permeability(20-5000mD, average of 430mD). The regional shale, intrabed shale, bitumen and underlying basement are sealing layers. The main trap type are lithologic stratigraphic traps. Faults, unconformities and connective sandstones formed excellent combination of oil migration pathways. biodegration occured during the long distance migration (50-200km) period in the late Miocene and main accumulation period in the Pliocene-Pleistocene are the main viscosifying factors. The gas chromatography analysis of saturated hydrocarbon components (C10+) of heavy oil from many samples showed the n-paraffins and isoprenoid have different degrees of consumption due to high level of biodegradation.

The accumulation model is long distance migration biodegradation and concentrated shallow burial. Source rocks, migration pathways and viscosifying mechnism controlled the heavy oil accumulation. The western part, the Oficina formation and stratigraphic related traps are the key points for exploration.

Stable isotope analysis of carbonates using Isoprime MultiFlow-IRMS

YAN LIU [12], JINCAI TUO[1*], CHENJUN WU[2] AND D RU CHEN[2]

[1] Key Laboratory of Petroleum Resources Research Institute of Geology and Geophysics Chinese Academy of Science Lanzhou, 730000, China (correspondence:jctuo@lzb.ac.cn)

[2] Graduate School of the Chinese Academy of Science, Beijing, 100039, China (yanliu@lzb.ac.cn)

Isoprime MultiFlow is the pretreatment device which can connect with Isoprime 100 (IRMS) for carbonates analysis. We found that the $\delta^{18}O$ values decreased when the CO_2 sample peaks increased higher in our experiments. The empirical linear regression of the $\delta^{18}O$ value was a function of the CO_2 quantity, which was useful to correct the deviation caused by the decreasing trend of $\delta^{18}O$ value. In addition, we tested the analysis linearity of IRMS and the fractionation of other interfaces. The results showed that the temperature of GC column in MultiFlow was significant factor for the variation of $\delta^{18}O$ value. Although the user guide recommended that 100°C was a sufficient setting for separating the gas species of interest, we found that 60°C for GC column was better to adjust the decreasing of $\delta^{18}O$ value. We inferred that the high temperature would cause the oxygen isotope exchange between CO_2 and the filler inside the GC column.

Research supported by Key Laboratory of Petroleum Resources Research,Institute of Geology and Geophysics,Chinese Academy of Sciences and NSFC(41202093).

DOI:10.1180/minmag.2013.077.5.12