

SOURCE ROCK CHARACTERIZATION OF PALEOGENE COAL AND ORGANIC RICH MUDSTONES IN XIHU SAG, OFFSHORE EASTERN CHINA

Xinjian Zhu ¹, Jianfa Chen ¹, Kaixuan Liu ¹, Liwen He ¹, Tonglei Zhang ²

¹State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum, Beijing, China

²Shanghai Branch of CNOOC(China) Ltd, China

The oil and gas accumulation associated with coal-bearing sediments in Cenozoic have been discovered in Xihu Sag, East China Sea Shelf basin(ECSSB), which is located at the offshore region of eastern China. However, the petroleum system analysis presents a complex series of problems because of the large spatial separation of source rocks and rapid source rock burial rates in the Xihu Sag, ECSSB. These factors make it difficult to predict the oil and gas distribution and hinder the hydrocarbon exploration. Furthermore, it is still in a low stage of the hydrocarbon exploration and development in Xihu Sag, ECSSB. Therefore, the source rock characteristic and hydrocarbon generation potential of Paleogene coal and organic rich mudstones should be researched urgently.

Detailed organic geochemical analyses were performed on Paleogene coal and organic rich mudstones which are collected from WDG area and CUG area in the Xihu Sag, ECSSB. While 80% of the analysed samples have total organic carbon (TOC) contents greater than 1%. Coals from WDG and CUG area have relatively high TOC values with an average value of 55.30wt% compared to the carbonaceous mudstones with an average value of 19.6 wt% and mudstones with an average value of 1.79 wt%. In addition, hydrogen index (HI, $S_2 \times 100 / \text{TOC}$) values of coal and carbonaceous mudstones samples (193.49 to 386.9 mg HC/g TOC) are relatively higher than the mudstones samples (36.36 to 259.24 with an average value of 121.72 mg HC/g TOC). The results suggest that these Paleogene coals and organic rich mudstones have mainly fair–excellent source rock richness. The Rock-Eval data, maceral compositions indicate that the samples in both WDG and CUG area generally plot in the zone of mixed Type III–II2 kerogens. While biomarker analyses indicate the dominance of higher plant derived organic matter for WDG area and some mixed source input for CUG area. Vitrinite reflectance (VR), Tmax, production index (PI) and biomarker parameters were utilized in this study to assess the thermal maturity of organic matter thermal maturity. Most samples in CUG area have thermal maturity greater than 1.0%, while samples in WDG area are about 0.8%.

The characteristics of the source rocks of Paleogene coal and organic rich mudstones in Xihu sag, ECSSB reveal that the source rocks in both WDG and CUG area have fair to excellent hydrocarbon generative potential, but vary in hydrocarbon phase. Source rocks in WDG area are expected to generate both commercial liquid hydrocarbons and gaseous hydrocarbons, while CUG source rocks exhibit a dominant gaseous hydrocarbon generation and a bit of liquid hydrocarbon generation potential.

References

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