ORIGIN AND GEOCHEMICAL IMPLICATIONS OF RELATIVELY HIGH ABUNDANCE OF 17α(H)-DIAHOPANE

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Introduction

Since 17α(H)-diahopanes have been determined by X-ray crystallography (Moldowan et al., 1991), biomarker 17α(H)-diahopane has been commonly used for oil/oil and oil/source rock correlation in petroleum geochemistry. There occurs relatively abundant C_{30} 17α(H)-diahopane in oils or source rocks in many basins all over the world, especially in China, such as Yanchang Formation in Ordos basin, Jurassic lacustrine oils in Sichuan basin and oils in Kuche depression. A mass of researches have been performed on the geochemical significance of 17α(H)-diahopanes (Moldowan et al., 1991; Philp and Gilbert, 1986; Li et al., 2009; Yang et al., 2016), however the disputes over their origins and geochemical significance still exist. As well, Relatively abundant 17α(H)-diahopane has been detected in dark mudstone extracts from Xinhe Formation, in Yabulai basin, while the concentrations differ significantly. The precise reason for high abundances of rearranged hopanes remains unresolved yet.

Samples and analytical methods

Dark mudstones as source rocks were collected from the Xinhe Formation and Qingtujing Formation in Yabulai basin. All samples were extracted using a Soxhlet apparatus with about 500mL of solvent mixture of dichloromethane and methanol (83:17 v/v).

The extracted bitumens were fractionated into saturated, aromatic hydrocarbons, NSOs and asphaltenes using open column chromatography and a series of elution solvents with increasing polarity.

Saturate fractions and aromatic hydrocarbons of extracts were analysed using gas chromatography (GC) and GC-selected ion and full scan mass spectrometry (GC-MS) for molecular biomarker and aromatic composition analyses.

Minerals contents of dark mudstones have been analysed by X-ray diffraction method, and samples were observed in the environment scanning electron microscope.

Results and discusion

It seems that there exists positive correlation among 17α(H)-diahopane, 18α(H)-22,29,30-trinorneohopane (Ts) and C_{29}Ts, which infer that there is a critical factor inducing methyl migration. Simultaneously, Samples with relatively high abundance of 17α(H)-diahopane contain more or less carbonate, which exist in alkali condition. By X-ray EDX (energy dispersive microanalysis), we can observe organic matter included in calcite or carbonate.

Nevertheless, as to the forming mechanism, many researchers maintain that clay-mediated acidic catalysis cause methyl migration. The concentrations of 17α(H)-diahopane in mudstones are variant significantly, which indicate that there may be a factor induce clay minerals being catalytic. Furthermore, acidic condition may not be the reason for methyl rearrangement. The chemical action generating carbonate during diagenesis maybe catalyse methyl migration, being favourable for rearrangement occurring.

References

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