Characteristics of macerals and their depositional mechanism of lacustrine shale in Dongying Sag, China

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The origin, accumulation and deposition pattern of macerals can affect hydrocarbon potential and quality of source rocks. In this study, 235 samples were selected from lacustrine shales of the Shahejie Formation (middle Es3, lower Es3, upper Es4c and lower Es4c members) in Dongying sag, China. Palynological and pyrolytic analysis were used to discuss the origin and sedimentary mechanism of macerals.

Results showed 4 types of macerals that could be divided according to the sedimentary patterns. The 1st type had high hydrogen indices (HI) of 518 and TOC of 2.79%. It mainly consisted of amorphous organic matter (AOM) in which microfossils of Transparent extracellular polymers could be observed. These macerals were formed in a deep-lake chemical sedimentary environment. The 2nd type was dominated by macrophytes in which tiny layers and cellular structure were visible. The values of HI were 536 and TOC were 3.68%. It was developed in an autochthonous environment. The TOC of the 3rd kind of organic matter was 1.14% and HI of 248. It was composed of submerged and land plants, developing in a mechanical depositional environment. The 4th type consisted of asphalt residues, with HI and TOC of 177 and 1.04%, respectively. This macerals might be from AOM experienced high maturity stage. Therefore, the mechanical, chemical and autochthonous deposition were the mainly depositional mechanism of organic matter (OM) in paleolake. Thus it was convenience to analyze the difference of OM among the four submembers of Shahejie Formation. OM in middle Es3 enriched in type 3rd of maceral with a Type II and III kerogen. OM in lower Es3 and upper Es4c was mainly the 2nd and the 3rd type of macerals, respectively. The kerogen was mainly Type I and II. The macerals of type 4th was the primary OM in lower Es4c member. The variations of OM leaded to different hydrocarbon generation ability. Thus, study on depositional mechanism of maceral is significant.

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