

Controlling factors of organic matter accumulation in high quality source rock in Weixinan depression, Beibuwan Basin: implication from structural activity and depositional environment

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Abstract: Weixinan depression is petroleum prolific area in Beibuwan Basin with lacustrine sediment. Liushagang Formation deposited with source rock bearing abundant organic matter in Paleogene. Source rock is divided into three classes according to oil-source correlation and comparison with other basins, named as normal source rock (TOC ranging from 0.5 to 2.0%), high quality source rock (TOC above 2.0%) including oil shale (TOC above 5.0%). Oil shale is characterized by high hydrocarbon generation potential (above 20.0mg/g), mainly type III kerogen and minor type I kerogen from aquatic organism, high gammacerane content. In contrast, a senior hydrocarbon generation potential (6.0-20.0 mg/g), type II1-II2 kerogen, less gammacerane content and high tricyclic terpane occurred in high quality source rocks. Further, Star graph and crossplotting diagram are built to identify different source rocks combined with geochemistry analysis and well log data illustration. The formation and evolution of sags with source rock deposition are predominated by structural activity. Source rock thickness and organic matter abundance show positive relation with increasing fault activity rate. Organic matter supply and preservation conditions controlled the quality of source rock deposition. Oil shale deposited in brackish water and reduction environment with mixed input of aquatic algae and oil prone terrestrial organic matter. High quality source rock was formed in fresh to brackish and weak oxidation-reduction bottom water with senior salt water algae and minor fresh water algae. Normal source rock was dominated by higher fresh water algae and low gammacerane content, showing fresh water and weak oxidation setting. Based on comprehensive function of structural activity and depositional conditions, accumulation model of organic matter under differential structural activity controlling conditions in Liushagang formation are established to provide reference for similarly deposition basins.

Keywords: Lacustrine source rock; organic matter accumulation; controlling factors