

IMPACT OF SALINE ENVIRONMENT ON SEDIMENTARY ORGANIC MATTER ORIGIN, TYPE, PRESERVATION AND HYDROCARBON GENERATION EVOLUTION IN SMALL TERRESTRIAL FAULTED LACUSTRINE BASIN: A CASE STUDY OF THE THIRD MEMBER OF SHAHEJIE FORMATION IN THE DONGPU DEPRESSION, BOHA

Tao Hu

China University of Petroleum-Beijing, College of Geosciences, Beijing, China

eric_hu_cup@126.com

ABSTRACT

Numerous small Mesozoic and Cenozoic terrestrial faulted saline lacustrine basins were developed worldwide, especially in China, in which the mudstones and shales are commonly excellent source rocks. The source rocks developed in saline depositional environment have significant differences in organic matter content, type, thermal maturity, and hydrocarbon generation potential with those developed in brackish or fresh environment. However, studies on the impact of saline environment on sedimentary organic matter origin, type, preservation, and hydrocarbon generation evolution process are still lacking. Dongpu Depression is a typical terrestrial faulted saline lacustrine basin in China, and three kinds of sedimentary environment with distinct boundaries were developed in the area of 5300km²: saline, brackish, and fresh environment. Under the background of similar structural settings, source rocks formed in different environment had great distinction in geochemical characteristics: the saline source rock was characterized by high organic matter contents and oil-prone organic matter type, while the brackish had moderate and preferably type, and the fresh source rock had low organic matter content and gas-prone organic matter type. Taking the Third member of Shahejie Formation of the Dongpu Depression as an example, this project firstly investigates the salt-rock distribution to determine the areas of saline, brackish, and fresh environment, and core sampling was carried out in typical wells of different environments. Then geochemical experiments were conducted to analyze impacts of paleo-climate, paleo-productivity, and oxidative-reductive conditions on organic matter origin, type, and preservation, revealing the function mechanism of saline environment on paleo-productivity, organic matter input and enrichment, and establishing the geological model of organic matter occurrence. Finally, following the previous study, typical samples representing different environment (saline, brackish, fresh) were selected to do thermocompression simulation experiment, establishing the geological model of hydrocarbon generation evolution. The forecast result was that the saline source rock has the highest total hydrocarbon yield, which is controlled by an integration of paleo-climate, paleo-productivity, and oxidative-reductive conditions. This project will not only enrich theoretical studies of saline environment on source rock development and hydrocarbon generation evolution in small terrestrial faulted lacustrine basin, but also will provide significant guidance in objective understanding the hydrocarbon generation potential difference and relative petroleum resource contribution of source rocks developed in saline, brackish, and fresh lacustrine environment.