# Research on the lower oily limits for shale in the Dongying Sag, Bohai Bay Basin, north China

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Oil can be generated and accumulated in shale, but the problem of lower oily limits for shale is difficult to solve. In this paper, small angle X-ray scattering (SAXS) was used to analyze the distribution of nanometers-cale pores and the lower oily limits. Different lithofacies core samples were collected from $Es_4^s$ shale in Dongying sag for comparison study, which are source rocks with large reserves of shale oil and gas.

The results showed that the relative content of clay minerals presented a good linear relationship with micro mesoporous and large mesoporous. With the relative content of clay minerals increasing, the volume percentages of micro mesoporous (2~10nm) increased and the volume percentages of large mesoporous (25~50nm) decreased.

The same samples were eluted with acetone for taking away the oil accumulated. After the elution test, the distribution of pore size changed, especially in the range of micro mesoporous. The peak shape of micro mesoporous became higher than before, which indicated oil accumulation. Meanwhile, the volume percentages of micro mesoporous in samples with higher content of clay minerals and samples with higher content of carbonate showed the biggest growth in 5~6nm and 7~8nm, respectively. Therefore, it is indicated that shale oil can accumulate in the micro mesoporous, and the lower oily limits in shale was the range of 5~6nm.