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Effects of stratum overpressure on diagenesis in Niuzhuang Sub-sag of Bohai Bay Basin, China

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Abstract: An obvious overpressure systerm was found within deep strata in Niuzhuang Sub-sag of Bohai Bay Basin, and the depth of overpressure top surface from the basin center to the edge gradually becomes shallow. Based on the previous studies as well as the application of pyrolysis analysis, biomarkers, microscopy and SEM, and compared with relative characteristics of the normal pressure environment in the adjacent area, the influence of overpressure on diagenesis is deeply analyzed. The results showed that: (1) Overpressure has no identifiable effect on the indexes (including vitrinite reflectance, pyrolysis peak temperature, production index, etc.) that reflect the thermal evolution characteristics of organic matter, however, it has obvious inhibitory effect on the reaction of clay mineral transformation and hydrocarbon structure evolution, which have high concentration change rate and strong volume expansion effect. (2) Overpressure can reduce the mechanical compaction rate of sandstones, so that the porosity is effectively preserved. (3) Overpressure can reduce the material source of cemented materials by inhibiting the transformation of clay minerals, while inhibiting the formation of carbonate cements by increasing the solubility of carbonate in fluid medium. (4) The reservoir in the study area is generally high in CO_2, and the solubility of CO_2 in the fluid is increased in the overpressure environment, while a large amount of H+ can be generated to promote the formation of dissolution. (5) Overpressure environment promotes the discharge of acidic fluids generated by hydrocarbon generation of hydrocarbon source rocks, enhances the dissolution of adjacent sandstone reservoirs, which is advantageous to the formation of secondary pores, thus developing abnormal high pore belts.
Key words: Niuzhuang Sub-sag; Stratum Overpressure; Fluid; Diagenesis