

The Carbonate Mineralization in Sandstone Reservoirs Near the Top Overpressure Surface in Dongying Depression

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The top overpressure surface with burial depth from 2200~2800m is significant influenced by the episodic migration of overpressure fluid in Dongying Depression, which have conduced the carbonate mineralization in sandstone reservoirs closed to the top pressure seal, frequently ranging from 15~40% for carbonate minerals. Statistical analysis with electron probe data indicates that the carbonate minerals can be subdivided into three groups (calcite, dolomite and ankerite). By integrating analysis with X-ray diffraction, Cathodoluminescence and other means, we determined it's diagenetic sequence: penecontemporaneous dolomite → calcite → ankerite. Based on the data of primary inclusions within carbonate cement, we found that the carbonate precipitation is intimately related to overpressure fluid, with paleopressure coefficient 1.29~1.62, and the precipitation is significant influenced by thermal fluid invasion. Therefore, we proposed that the precipitation of calcite cement and ankerite cement maybe related with movements of overpressure fluid at the terminal Dongying stage and from the early Minhuazhen stage to present respectively. Then, this hypothesis has been checked by oxygen isotope data, which demonstrated that the oxygen isotope composition fluctuates from -16.86‰ to -12.29‰PDB for calcite and from -12.20‰ to -10.20‰PDB for ankerite. Integrated investigations basically indicated that the calcite precipitation temperatures ranging from 90~120 °C, with $\delta^{18}\text{O}_{\text{SMOW}}=0.00\text{‰}$ of homo-overpressure fluid; and the ankerite precipitation temperatures ranging from 110~135 °C, with $\delta^{18}\text{O}_{\text{SMOW}}=0.25\text{‰}$ of homo-overpressure fluid.