Influence of mineral components and their diagenetic evolution process on tight sandstone reservoir quality of the Chang 7 group, Ordos Basin

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Sandstone type, detrital components and cements, impact of diagenetic evolution processes on reservoir quality of tight sandstone reservoir of the Chang 7 Group, Upper Triassic from the southwestern Ordos basin, China are studied, based upon observation of cores, identification of thin sections under microscope, measurement of pores and pore throats, porosity and permeability, homogeneous temperature of fluid inclusions. Research shows that sandstone type and its detrital components and primary reservoir capacity controls diagenetic evolution process to a great extent, and its in turn resulted in a chronological sequence of sandstone densification.

Compaction is the major diagensis leading to pore loss for sandstones, except for calcareous sandstone, which gives rise to av. of 21.6% and 16.0% pore loss for litharenite with high content of plastics and oil-immersed sandstones, respectively. Cementation caused av. of 7.4% and 13.4% pore loss, respectively. Litharenites with high plastics experienced intensive compaction in early diagenetic phase, compacted deformation, expansion and metrication of plastics resulted in a large number of inter-granular pore loss and throat blocked, giving rise to pore reduced rapidly, making the sandstones to be low to very low permeability reservoir and a part of them even tight sandstones after early diagenetic phase. Cementation caused average of 28.5% pore loss and is the major diagenesis resulted in pore loss for the calcareous sandstones, carbonate is the main cement resulted in pore loss. Great part of calcareous sandstones with very low permeability and tight ones occurred duo to carbonate cementation in early diagentic phase (80-90ºC), whereas they resisted compaction to some extent, so that pore loss by compaction greatly decreased (av. 3.8%). A large quantity chlorite films on grains, low content of carbonate and quartz cements in oil-immersed sandstones resulted in significant primary inter-granular pores preserved, together with developed inter- and inner-granular dissolution pores led the sandstones to a good oil-bearing reservoir. Dissolution is the main factor improved the sandstone reservoir, which added pores of 1.3%, 1.4% and 3.5%, respectively.