The controls of ultra-deep clay minerals on the property of GAS reservoir in Kuqa depression，Tarim basin，China

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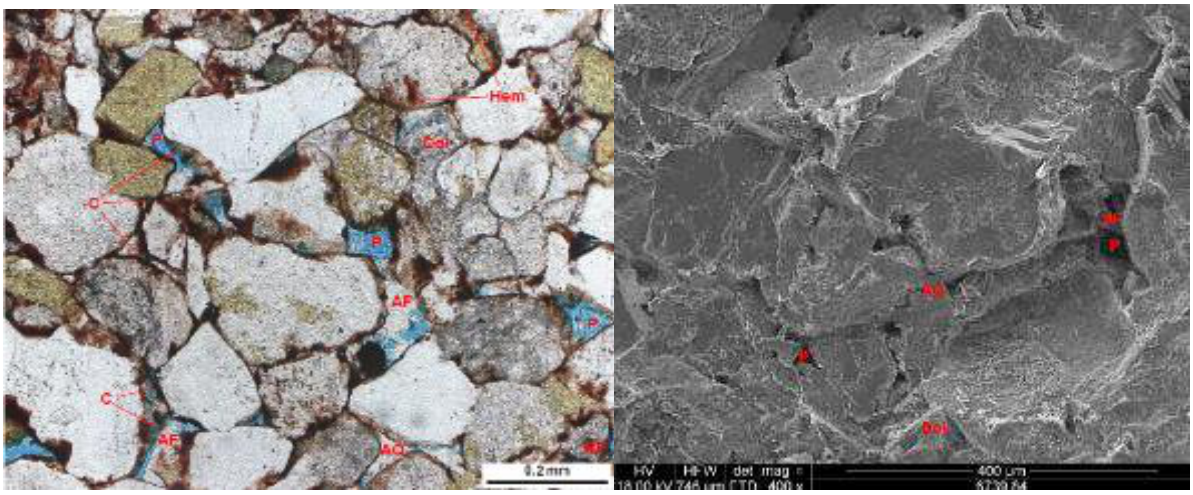
Abstract

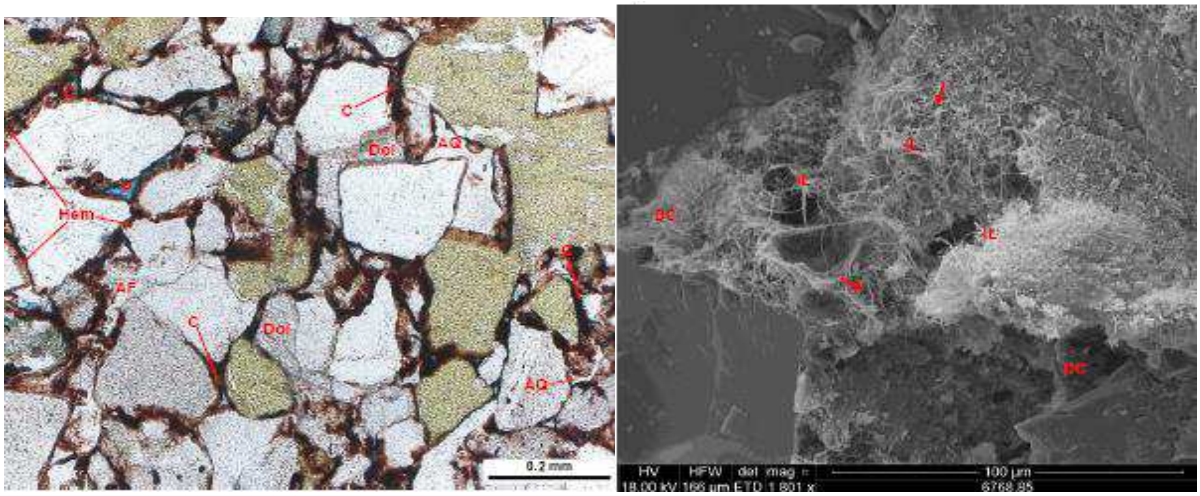
Objectives: The ultra-deep reservoir in Kuqa foreland thrust belt with properties of ultra-low porosity, ultra-low—low permeability，fracture-pore spaces and high yield test is very important target for gas exploration and development at present.

Methods: To elucidate the characteristics of clay minerals and its control functions on reservoir evolution and reservoir characteristics, this paper is based on lots of micro-experiment analysis(X-ray diffraction, scanning electron microscope, confocal laser scanning microscope, casting thin sections, high pressure Hg injection).

Discussion of conclusion: Results indicated that clay mineral content is 5-12% composed by illite and illite-montmorillonite mixed-layer mainly and chlorite secondly. The clay minerals are generated by succession sedimentary water precipitation in early stage of diagenesis and feldspathic dissolution in middle and late stage of diagenesis（Fig.1）. The ealy sedimentary clay mineral in the sandstone are mainly enriched in the edge of the delt front or near the top and bottom of the water channel ,and its membrane can effectively inhibit overgrowth of quartz and feldspathic in the ultra-deep reservoir in early and middle stage of diagenesis and preserve matrix pores. The clay matrix of different stage can provide mineral intercrystal micropores with porosity of 1-4% and the intercrystal micropore is one of the main gas reservoir spaces（Fig.2，Fig.3）. Clay minerals are the main controlling factor for reducing reservoir permeability. The clay mineral content of 6-9%(especially illite and illite-montmorillonite mixed-layer) can reduce the permeability of ultra-deep reservoir by 10-100 times, and result the overall permeability is $0.01\text{-}0.1\times10^{-3}\mu m^2$. The content of clay mineral and its occurrence characteristics are the key factors for the well preservation of reservoir in the long time(130-23Ma) shallow buried(<3000m) period, the dramatic decrease of matrix permeability in late(23Ma~) deep buried(>3000m）period and reservoir overall densifying($<0.1\times10^{-3}\mu m^2$) .



Well1，6739.48m，clay content 8.2%，mainly composed of sedimentary formation and film.，AQ：Authigenic quartz，KF：Potassium feldspar，AF：Authigenic feldspar，I/S: Illishi montmorillonite mixing layer，C：clay，P：pore，left：casting thin sections，right：Scanning electron microscopy



Well2，6768.65m，clay content 8.5%，based on sedimentary formation, film and filling,AQ：Authigenic quartz，KF：Potassium feldspar，AF：Authigenic feldspar，DC：clay，I/S: Illishi montmorillonite mixing layer，P：pore，left：casting thin sections，right：Scanning electron microscopy

Fig.1 Micrograph of clay minerals in reservoir of Bashijiqike reservoir In the ultra-deep Cretaceous

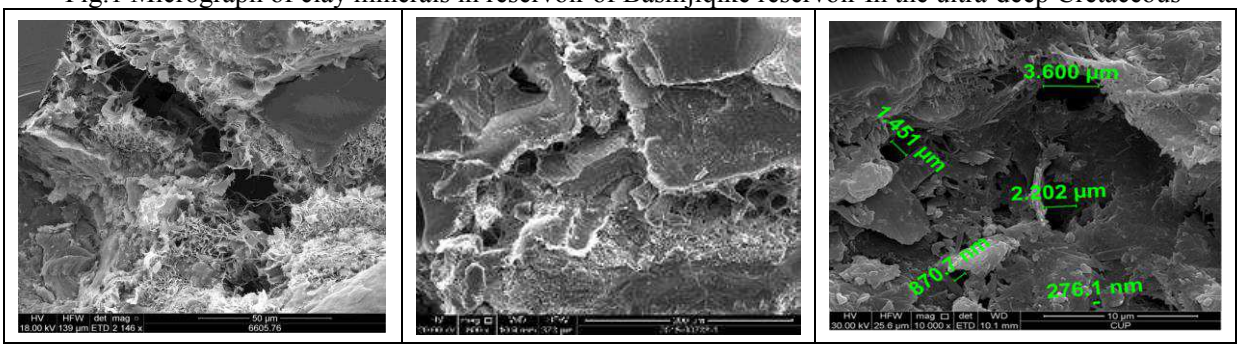


Fig.2 Pore throat blocked with clay minerals and micron pore throat feature of Bashijiqike reservoir In the ultra-deep Cretaceous

Application future: The characteristics and distribution of clay minerals with great geological significance to evaluate the sandstone reservoir properties and to predict the distribution of favorable reservoirs for ultra-deep gas.

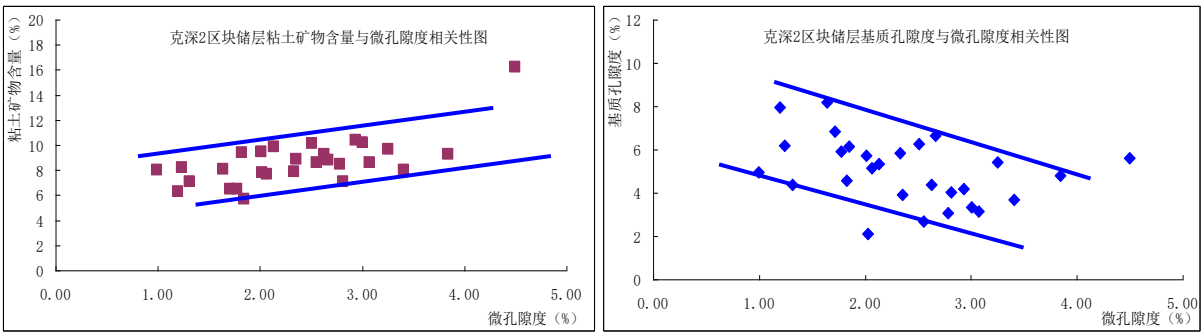


Fig. 3 Correlation diagram of the content of clay minerals and microporosity in the pashkiki formation of the ultra-deep Cretaceous reservoir.

Key words: Tarim Basin, Kuqa Depression, Cretaceous, Ultra-deep，Reservoir, Clay Mineral

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