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## Petrologic Characteristics of Gas Hydrate Reservoir in the Qilian Mountain Permafrost, China

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Up to now, 8 drills have been completed in the Qilian Mountain permafrost, since the first gas hydrate sample was drilled in the drill DK1 on November 5, 2008. Among these drills, gas hydrate samples had been drilled in drills DK2, DK3, DK7 and DK8, and abnormal indication of gas hydrate had been found in drills DK4, DK5 and DK6. Gas hydrate and its abnormal indication are occurred from 130m to 400m beneath the surface, belong to the Jiangcang Formation of middle Jurassic. Based on the lithology and occurrence, the reservoir of gas hydrate can be divided into mudstone and oil shale reservoir dominated by fissures and sandstone reservoir characterized by fissures and pores.

Lithological combination of mudstone and oil shale reservoir is dark grey, black grey and black brown mudstone and oil shale, interbedded with thin siltstone. Mudstone and oil shale reservoir have much lamellation and fissure, and these generally are filled with calcite. The main mineral composition include clay mineral composed with kaolinite, illite and montmorillonite (>50%), amorphous mineral (>20%) and quartz particles (>10%). Moreover, few dolomite, calcite and pyrite are existed in some samples. Because none pores are in mudstones and oil shales, the main reservoir spaces are fissures, and the gas hydrate is occurred in them like thin ice.

The lithology of sandstone include grey and dark grey siltstone, fine sandstone and middle sandstone with parallel bedding and wavy bedding. Fissures are well developed in some intervals, even the whole core is broken. The main elastic particle of sandstone is quartz (>70%), the next is rock debris (>20%) including quartzite

and few crystalline rock, igneous rock and quartz schist, and the last is the feldspar (<10%). Heavy mineral (<2%) include garnet, talc and zircon. The interstitial material include argillaceous matrix and cements like siderite, ankerite, pyrite, secondary kaolinite and secondary enlargement of the quartz. Except for visible fissures dominated by structure, the main reservoir space include inter-grain pore, dissolved pore and microfissure. However, the strong compaction, weak dissolution and filling action of argillaceous matrix caused that pore and microfissure had little contribution for reservoir space of gas hydrate. In sandstones with little fissures, the porosity and permeability are less than 10% and 20 millidarcies separately. According to the standard of oil and gas reservoir, these sandstones are belong to the low porous and low permeable reservoir. Therefore, fissures are the main reservoir space of gas hydrate in sandstones, and pore and microfissure are secondary reservoir space.

Based on the analysis of petrologic characteristics, mudstone and oil shale reservoir has none pores and sandstone reservoir has few pores and microfissure. The main reservoir space of gas hydrate is fissure system dominated by region fault in Qilian Mountain permafrost.

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