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Gas occurrence and accumulation characteristics of Cambrian-ordovician shale's in the Tarim basin, northwest China

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The Tarim basin is located in the northwest China and is the biggest basin in China with huge oil and gas resources. The Cambrian and ordovician possess the major marine source rocks in the Tarim basin and large shale gas resources potential. The Cambrian-ordovician shale's were mainly deposited in basin-slope facies with the thickness as 30~180 m. For the shale's buried shallower than 4500 m, they have high organic matter abundance with TOC (Total Organic Carbon) mainly between 1.0% and 6.0%, favorable organic matter types of type I and type II and high thermal maturity with RoE as 1.0%~2.5%. The mineral composition of these Cambrian-ordovician shale samples is mainly quartz and carbonate minerals while the content of clay minerals is mostly lower than 30%, because these samples include siliceous and calcareous shale and marlstone. The Cambrian and ordovician shale's are compacted with mean porosity as 4% and 3%, permeability as $0.0003 \times 10^{-3} \sim 0.09 \times 10^{-3} \mu\text{m}^2$ and $0.0002 \times 10^{-3} \sim 0.11 \times 10^{-3} \mu\text{m}^2$, density as 2.30 g/m³ and 2.55 g/m³, respectively. The pores in these shale samples show good connectivity and are mainly mesopores in size. Different genetic types of pores can be observed such as inter-crystal pore, inter-granular pore, dissolved pore, organic matter pore and shrinkage joint. The reservoir bed properties are controlled by the mineral composition and diagenesis. The maximum adsorption amount to methane of this shale's is 1.15~7.36 cm³/g, whose main affecting factors are organic matter abundance, porosity and thermal maturity. The accumulation characteristics of natural gas within this shale's are jointly controlled by sedimentation, diagenesis, hydrocarbon-generating conditions, reservoir bed properties and occurrence process of natural gas. The natural gas underwent short-distance migration and accumulation, in-place accumulation in the early stage, adjustment and modification in the later stage. Finally, the Y1 and T1 areas are identified as the targets for shale gas exploration in the Tarim basin.

Biography

Luofu Liu is currently a Professor at China University of Petroleum, Beijing. He has received his PhD from Bristol University in 1978. His main technical interests are in organic geochemistry and petroleum geology.

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