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Palaeo-tufa from Liuhuanguo No 2 cave in the Ordovician carbonate, North Tarim basin, China: features and petroleum significances

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A 3-4 km wide and more than 100 km long limestone palaeokarst belt occurs in the Ordovician limestone at the south edge of Tianshan. In this belt, there are up to roughly 900 m thickness of weather crust deposits (Speleothems) and at least more than 30 palaeokarst caves in the Yingshan Formation. Among them, the Liuhuanguo No 2 cave of, a well-developed palaeokarst cave, is located in a narrow and steep strike-slip fault belt. A great deal of oil bearing tufas depositing in the fractures and cavities has been discovered in the palaeokarst cave with the color ranging from white to black, mostly yellowish brown. Based on their texture and shape, six types of the tufa laminae can be classified as layered laminae, wavy laminae, coated crust laminae, fascicular laminae, dome or hemispherical dome shaped laminae and messy laminae, related to the microbial activities. Tufa laminae are composed by column, needle or granular calcite crystal. The extensively developed intercrystal fractures and pores make the Liuhuanguo No 2 cave tufa a good reservoir with the low porosity (ranging from 3.81% to 13.91% with the average of 7.21%) but high permeability (ranging from $2.99 \times 10^{-3} \mu\text{m}^2$ to $87.60 \times 10^{-3} \mu\text{m}^2$ with the average of $48.99 \times 10^{-3} \mu\text{m}^2$), which may be caused by their special inner texture and are named as the tight high permeability reservoir. Since the intercrystal pores are mainly pore types in tufa, the closely compacted calcite crystals causes porosity quite low but the connected crystal pores makes the permeability.



This study has confirmed the existence of palaeo-tufa in early Ordovician limestone in the process of karstification and their petroleum significance. First, the paleo-tufa is a good reservoir with higher permeability even low porosity. Second, the paleo-tufa can be also a good source rock with high hydrocarbon producing ability.

Figure 1: Oil bearing layered paleo-tufa in the Ordovician carbonate, North Tarim

basin, China

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