Evidence of underground water for the forming mechanism of high sulfur condensate reservoirs, Example from the Tazhong area

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Condensate gas reservoirs with high content of hydrogen sulfide have been discovered on a large scale in deep marine carbonate formations in the Tarim Basin, which contain formation water with high salinity. Investigations show that, in the Tazhong area, the average negative and positive ion contents in the lower Ordovician to Cambrian formation water are higher than that in the upper Ordovician formation water. Yingshan formation with high-sulfur condensate reservoir is similar to the lower Ordovician to Cambrian formation in water properties, that is to say, the content of Mg^{2+} and SO_4^{2-} and PH value are higher than those in the upper Ordovician formation; these mineral ions and PH are crucial to thermochemical sulfate reduction. Hydrogen sulfide content in Yingshan condensate reservoir and Mg^{2+} content of formation water correlates well in the Tazhong area, which indicates a presumable TSR-origin of hydrogen sulfide according to the reaction theory of contact ion-pair. Besides, the total salinity and pH value of formation water are positively correlated with hydrogen sulfide content in the condensate reservoir, which may indicate that high salinity and pH value are important to activate and maintain TSR reaction. High sulfur condensate reservoirs are all located near the No. I faulted zone and strike-slip faults which are the major pathway for deep fluid migration in the area, showing that the formation water in condensate reservoirs may communicate with high salinity fluid in the lower Ordovician to Cambrian formation and hydrogen sulfide flowed upwards with formation water from deep zones along fractures to form condensate reservoirs with high sulfur content and high salinity. The discovery reveals the forming mechanism of high sulfur condensate reservoirs in the Tazhong area and will be helpful to predict the reservoir fluid properties.

Tectonic setting of the Xigaze ophiolite complex in Tibet based on the characteristics of boninite

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The Xigaze ophiolite complex contains the best preserved ophiolite blocks in the middle section of the Yarlung Zangbo ophiolite belt. It composes of several fragments and extends about 200 km long and ~ 8 km wide. The ophiolite complex consist of five lithologic units, including mantle peridotite, melanocratic to leucocratic cumulates, sheeted dyke complex, pillow lavas and diabase dykes. Most of the basic lava and sheeted dyke complex from the Dejixiang ophiolite are calc-alkaline with variable SiO_2 ranging from basalt to andesite. Their LREE-depleted REE patterns show affinity of N-type MORB (or BAB). The diabase dike samples exhibit low TiO_2 (<0.5%), high MgO (up to 18.24 wt%) and $Mg^{\#}$ (68.3-83.7) and remarkably high mantle compatible elements Cr, Co and Ni. They exhibit low REE abundances and LREE-depleted REE patterns with $[La/Sm]_n$ = 0.63–0.90, which are distinct from the U-shaped REE patterns of typical boninites that occur in forarc settings but similar to the boninites from the back-arc basin [1,2,3]. Ol, Sp and Opx were observed in these rocks. We conclude that (1) the Dejixiang ophiolite formed in a backarc basin setting, rather than in the mid-ocean ridge (MOR) or in a fore-arc environment and (2) the boninites are high-Ca type that formed in the late stage of back-arc basin environment during continuous extension of the spreading center that caused further melting of the depleted mantle, these melts intruded as diabase dykes into the former oceanic crust that formed the Dejixiang ophiolite during the early spreading stages of the back-arc-basin. These ophiolite blocks reflect the transition from spreading ridge to arc of the Tethys ocean.

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