ZHANG Hua, LIU Chenglin, CAO Yangtong and WU Kun, 2014. Discussion on the Scenario of Salt Accumulation in Yarkand Basin During Late Cretaceous. *Acta Geologica Sinica* (English Edition), 88(supp. 1): 277.

Discussion on the Scenario of Salt Accumulation in Yarkand Basin During Late Cretaceous

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Large-scale accumulation of salt and formation of potash concentrated in Tethys domain during late Mesozoic to early Cenozoic. These events were typified by the formation of Laos-Thailand and Lanping-Simao potash basin in the southern branch of Tethys and characterized by Central Asian Jurassic potash deposit and Cenozoic deposition of salt in Tarim basin in the northern branch of Tethys.

The Yarkand basin which is a sub-basin of southwestern Tarim basin has located in the northern branch of Tethys since late Cretaceous. The salt-bearing sequence within Yarkand basin contained carbonate rock of Yigeziya Formation (upper Cretaceous) at the bottom and salt rock dominated by halite of Tuyiluoke Formation (uppermost Cretaceous) at the top, with the significant absent of gypsum or anhydrites between these two Formations. The above salt-bearing sequence in the outcrops was consistent with that in the recent boreholes. For example, the Tuyiluoke Formation with halite thickness up to 287m in borehole WB1 in Kashi despression overly the Yigeziya Formation carbonate rocks and salt-bearing sandstones or salt-bearing gypsum between these two Formations was just with thickness of 0.6m. However, the thickness ratio between gypsum and halite is 1:21.7 during evaporating concentration of normal seawater which implies that gypsum with thickness of at least 13meters should be deposited before the formation of halite in or around borehole WB1. Unfortunately, gypsum beds with such thickness or even less have been not found in Tuyiluoke Formation in entire Yarkand basin. Therefore, it can be inferred that the gypsum rocks has deposited some other places during Tuyiluoke Formation deposited which led to that Tuyiluoke Formation was dominated by halite and without or with less gypsum since seawater concentration has been increased by the previously deposition of calcium sulfate.

Stratigraphic correlation shows that late Cretaceous regression in Asian basins including Fergana basin, Karakum basin and Afghan-Tajik basin also happened in Yarkand basin. Upper Cretaceous in Asian basin was characterized by shallow water deposits of gypsum or gypsum-bearing mudstones. Normal marine deposits were only seen in west Karakum region where the main body of the northern branch of Tethys should be during this interval. The shift of sedimentary face from normal marine deposits in west Karakum to shallow lagoon deposit of gypsum or gypsum-bearing mudstone in karakum basin, Fergana basin and to saline lake deposits of halite in Yarkand basin displayed an increasing trend in salinity of water body from west to east.

Here we suggested a preliminary scenario for salt accumulation in Yarkand basin that Asian basins including Karakum basin, Fergana basin and Afghan-Tajik basin might play role in preparatory basin where amount of gypsum or anhydrites deposited during late Cretaceous seawater invading into Yarkand basin from Tethys in the west. Seawater with higher concentration due to previously large-scale deposition of gypsum or anhydrite in Asian basins invading into Yarkand basin resulted in the formation of evaporates dominated by halite and without calcium sulfate in Yarkand basin. The similar scenario for salt accumulation was also seen in Thailand-Laos potash basin where halite with thickness up to 850 meters but basement anhydrites with average thickness of 1.1 meters occurred and potash deposited during late Cretaceous (Tabakh, 1999) which also indicated that the concentration of seawater has been increased before seawater invading into these potash basins since the early-stage calcium sulfate deposited in other preparatory basins. The similar scenario of salt accumulation between Yarkand basin and Thailand-Laos potash basin suggested that Yarkand basin has geological condition for potash formation and prospect for potash exploration.

Key words: salt accumulation, Cretaceous, Yarkand basin

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