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Sedimentary Model and Reservoir Distribution of Cambrian Evaporite-Carbonate Paragenesis in the Sichuan Basin, Southwest China

Anna Xu¹, Suyun Hu¹, Zecheng Wang¹, Dongmei Bo¹, Zhai Xiufen¹

¹ Research Institute of Petroleum Exploration & Development, PetroChina, Beijing, China, 100083
xan@petrochina.com.cn

The Cambrian evaporite-carbonate paragenesis includes the Lower Cambrian Longwangmiao Fm., the Middle Cambrian Gaotai Fm. and the Upper Cambrian Xixiangchi Fm. in Sichuan Basin. Recently, hundreds of billions of cubic meters of proved gas reserves are discovered in Lower Cambrian Longwangmiao Fm. of Anyue gasfield in center of the Basin [1, 2]. However, there is still no breakthrough in the other formations. Using seismic, drilling data and the geological interpreted results of the drilling-logs, cores and outcrops, on basis of analysis of structure and sedimentary background, the stratigraphic framework, the sedimentary microfacies and the distribution of Cambrian gypsum-salt rocks are studied. Meanwhile, the sedimentary geological model is established and high quality reservoirs are predicted. The results: 1) Thickness of Cambrian evaporite-carbonate paragenesises becomes thinner from the southeast to northwest, and its stratigraphic framework is composed of two sequences of the third order sequence, and its depositional sequence changes from the evaporative carbonate ramp and the evaporative mixed restricted platform into the restricted carbonate platform. The sedimentary texture shows the retrogradation with five types of sedimentary rhythm about lithology assemblages. 2) The evaporites are formed in the evaporative lagoon and tidal flat with low energy condition behind the beach facies, and they are found in the five accumulative areas of the gypsum-salt rocks from the Longwangmiao Fm., the Gaotaizi Fm. and the Xixiangchi Fm. in east and south of the Basin. The scale of evaporites becomes smaller upward and most of them are formed in the high system tract (HST) of sea level decreased, but a few in the transgressive system tract (TST). 3) The sedimentary geological model of Cambrian evaporite-carbonate paragenesises includes the three different sedimentary layers, namely the evaporative carbonate ramp, the evaporative mixed restricted platform and the restricted carbonate platform. Their scopes of evaporates and the sedimentary rhythm are different, which are affected by the palaeogeomorphology and paleoclimate, microfacies, the scale of evaporating lagoon and sea-level fluctuation. 4)The rock types of favorable reservoir are grain, crystalline, and micritic dolostones with dissolved pores and its distribution are around the sequence boundaries the ancient uplift and the slope-breaks zone in the carbonate platform.

References:

[1] Wei Guoqi, Du Jinhu, Xu Chunchun et al. (2015) *Acta Petrolei Sinica* 36(1): 1-12

[2] Wei Guoqi, Yang Wei, Du Jinhu et al. (2015) *Petroleum Exploration and Development* 42(3): 257-265

