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Geological Characteristics and Hydrocarbon Accumulation Model of Sinian-Cambrian Plays in Sichuan Basin, Southwest China

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Recently, abundant gas reservoirs are discovered in Sinian-Cambrian Fm. from the Anyue area in middle of Sichuan[1], which is a deep and ultra-deep giant gas field, while about 30 wells in other areas are mainly water, dry or gas water-bearing layers. The main reason is that there are obvious differences about the depositional sequence, the tectonic and sedimentary evolution, and the hydrocarbon plays and accumulation models among the different areas of Sichuan Basin.

A integrated study method is put forward, which is by the seismic, logging, core, outcrop, geochemical analysis and test data. Based on gas components and isotope data from gas producing wells, the origin of gas in different areas is determined. Combining with the study of tectonic sedimentary evolution and hydrocarbon accumulation process, differences of the hydrocarbon pooling elements in different areas are analyzed, and a approach of hydrocarbon play division based on passage systems, reservoirs and accumulation process is taken, and their corresponding gas accumulation models are predicted.

The results: (1)The gas of different areas belongs to the crude oil cracking gas and comes from the different source rocks[2]. The source rocks at Anyue area in middle of Sichuan are black mudstones and mud-shalses in the underlying Lower Cambrian Qiongzhusi and Maidiping Fm., as well as black carbonaceous shales at the Third Member of Dengying Fm. in the Upper Sinian, but some gas in South and East Sichuan areas is probably from Silurian Longmaxi shale besides the Lower Cambrian Qiongzhusi and the Third Member of Dengying Formation. (2)Differences of the hydrocarbon plays and accumulation modes in Sinian-Cambrian Fm. in different areas are obvious . The Anyue area in middle of Sichuan is located in a stable palaeohigh, in which the strata is denudated and lack of gypsum-salt rocks, and four types of play are identified, such as the mixed source lateral-generation and lateral-reservoir type, the mixed source above-generation and below-storage-reservoir type, the mixed near source below-generation and above-storage-reservoir type and the mixed far source below-generation and above-storage-reservoir type, therefore the early primary accumulation models are dominated, showing "lateral or vertical migration, dissolved pore dolomites and multiple traps". However, the South and East Sichuan areas are located in a later steep thrusting structures, in which the strata is deformed and rich in gypsum-salt rocks, and three types of play are identified, such as the mixed source self-generation and self-reservoir type, the mixed source above-generation and below-storage-reservoir type, as well as the mixed source lateral-generation and lateral- reservoir type, so the later adjusted and destroyed accumulation models are dominated, showing "lateral or vertical migration, dissolved pore dolomites and steep thrusting structural traps". (3)The early primary and later adjusted accumulation models have most potentials to form giant gas field, and the later adjusted and destroyed models can also form large scale gas field under the effective sealing condition and the abundant supply of gas source.

References:

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