Petrochemistry-2013
OMICS Group Conferences
Accelerating Scientific Discovery
World Congress on
Petrochemistry and Chemical Engineering
November 18-20, 2013 Hilton San Antonio Airport, USA

Key controls on accumulation and high production of large non-marine gas fields in northern Sichuan Basin

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Abstract

Based on the data from multiple sample analysis and tests and exploration practice, key factors controlling gas accumulation,enrichment and high production in the continental Xujiahe–Ziliujing formations in Yuanba, Tongnanba and other areas, northern Sichuan Basin, were discussed. Natural gas in continental strata in this part of the basin are derived from the source rocks in the same strata,which are good - very good source rocks with high abundance of organic matter (mostly type III) and generally high mature – overmature to generate gas. Depending on provenance, multi-period (fan) delta systems are developed in the research area, where the main fluvial channel sands are superimposed in multi periods and distributed extensively, and reservoirs and source rocks form the “lower generation and upper storage” and “inter-bedded” assemblages. Five typical high-yield wells in the Jiulongshan, Malubei and Yuanba areas are investigated and an overall concept for exploration and research in the area is proposed: sedimentary source controls rock types,cementation types and sedimentary microfacies; source rocks control the size and location of gas accumulation; structural types control the magnitude and location of fractures; the combination of fracture and reservoir determines the level and retention duration of gas production. According to this model, the following areas have enriched gas and high production: Xu-3 and Xu-4 members of Xujiahe Formation in the western Yuanba and Jiange, Xu-4 member and Ziliujing Formation in the mid-eastern Yuanba, Zhenzhuchong and Xu-2 members in Malubei and Shabachang in the Tongnanba structure.