Natural gas accumulation characteristic of the reef-oolitic reservoir in LG area, Sichuan basin

WANG TONGSHAN[1*], LI XIA[1], AND LI QIUFEN[1]

[1] Research Institute of Petroleum Exploration & Development, PetroChina
wts2007@petrochina.com.cn (*presenting author)

Reef and oolitic gas reservoirs previously discovered in Changxing Fm.–Feixianguan Fm. of Sichuan Basin mainly are distributed in the platform margin zone near Kaijiang-Liangping Bay. This zone has high prospectivity for gas exploration at present [1]. Longgang area is located in the main body of platform margin zones on the southwestern sides of the bay. Longgang area is located in the gentle structural belt lying west of the Huayingshan fault zone.

Reef and oolitic reservoirs are controlled by the high energy facies belts on the south sides of Kaijiang-Liangping Bay, with only slight changes in width and spatial location corresponding to variations in paleoenvironment and paleotopography at different geological periods. The lithologies and spatial types of the reef and oolitic reservoirs are similar, as are their other properties such as porosity and permeability. The oolitic reservoirs of the Feixianguan Fm. in the Longgang area have a porosity of 2%–12% (5.8% on average) and a permeability of 0.06mD–223.7mD (27.7 mD on average). The gypsum rock units in the Lower Triassic Jialingjiang Fm. and Middle Triassic Leikoupo Fm. are thick (117m–557m), widely distributed, and act as the effective caprock for reef and oolitic gas accumulations. The type and salinity of formation water also support the strong preservation conditions of the reef and oolitic series of strata. The homogenization temperatures of fluid inclusions in the reef and oolitic reservoirs generally include three phases. The homogenization temperature for phase I was low (<120°C), indicating liquid hydrocarbon inclusions and early charging of liquid hydrocarbons. The homogenization temperature for phase II was 130°C–150°C, reflecting gas-liquid two-phase hydrocarbon inclusions as well as mixed charging of liquid hydrocarbons and their associated gas with gaseous hydrocarbons sourced from coal measures. The homogenization temperature for phase III was higher than 160°C, indicating brine-bearing gas hydrocarbon inclusions. In addition, the Laser Raman detection result shows H_2S-bearing high temperature gas hydrocarbon inclusions (dominated by methane) as well as liquid hydrocarbon pyrolysis and gas generation and accumulation events (Fig 1). Tectonic activities in the Himalayan period caused gas reservoirs to be destroyed or reformed. Gas reservoirs were subsequently shaped after the Himalayan period.

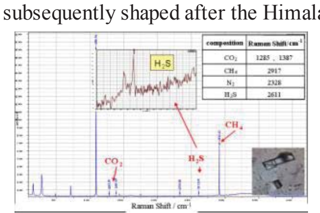

Figure1: Raman spectra of reef and oolitic reservoir fluid inclusions

This study has great significance in the promotion of research into gas accumulation and the development of gas fields in the region.

[1] Ma Y S *et al.* (2007) *AAPG 91*, 627-643.

Mapping geo-anomalies of hydrothermal mineralization in southeastern Yunnan district, China

WENLEI WANG[1*], JIE ZHAO[1], QIUMING CHENG[1,2,3] AND JIANGTAO LIU[1,3]

[1]Department of Earth and Space Science and Engineering, York University, Toronto, Canada, bznb@yorku.ca (*presenting author)
[2]Department of Geography, York University, Toronto, Canada
[3]State Key Laboratory of Geological Processes and Mineral Resource, China University of Geosciences, Wuhan and Beijing, China

Based on existing literature [1], controlling factors of hydrothermal mineralization in southeastern Yunnan district are granite intrusions, sedimentary carbonate rocks and complex structural features. Geo-anomalies associated with the superposition of these factors benefit mining activities in this area. Current research conducts an anomaly analysis by local singularity theory to characterize the influence of faults on the spatial distribution of geochemical signatures for enhancing mineral prospectivity.

Singularity theory is efficient to identify things' changing behaviors produced by geological processes, and the things can be materials, physical or chemical properties, events, and others with multifractality [2]. Discontinuously distributed geochemical signatures by tectonics are commonly used to delineate potential areas for targets of interesting. Applying singularity theory, geochemical anomalies of selected ore forming and associated elements are investigated and sorted into positive and negative, representing element accumulation and depletion properties, respectively. The positive anomalies well indicate weak local anomalies which are hidden within strong variance of background and were not properly identified by means classic methods. Moreover, selected element assemblages are integrated by Principal Component Analysis (PCA) to illustrate that the distribution of ore forming materials has undergone various geological processes. In the context of complex geologic structures, like highly faulted area, ore forming materials will have more space and time for migration and interaction with surroundings. Fault intensity defined as total length of faults per unit area is one of representatives of geologic structure complexity. By singularity theory, areas with increased intensity are identified to highlight spatial distribution properties of multi-element signatures.

For modeling mineral prospectivity, PCA is used further to integrate anomalies of element assemblages and fault intensity, patterns of which indicate both distribution of elements and migration tracks. The cross referencing of anomalies from geochemical and fault intensity efficiently characterizes the migration and sedimentation processes of ore-bearing hydrothermal solutions, and further supports researches on ore control mechanism.

[1] Zhuang et al. (1996) *Geology of Gejiu Tin-Copper Polymetallic Deposits*, 188p. [2] Cheng (2007) *Ore Geology Reviews* **32**, 314-324.