

Study on Sedimentary Facies of Chang 8 Member in Jiyuan Oilfield, Ordos Basin

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Abstract: Chang 8 member of Yanchang Formation is the major reservoir in Jiyuan Oilfield. With the development of oil and gas exploration, the areal heterogeneity of the reservoir has become an obstacle for further exploration and development, so the fine sedimentary facies description is particularly significant. Based on the analysis of sediment provenance and facies indicator, it is considered that Chang 8 member of Yanchang Formation is controlled by the provenances from the northwest and northeast, experienced the transformation from delta plain to delta front, and deposited distributary channel sand body which is superimposed vertically and continuous laterally. The physical properties of Chang 8₁ layer under different subfacies and different sources are contrasted. The result shows that the reservoir property of delta plain in Chang 8 layer is better than that of delta front, and the reservoir property controlled by the provenance from northwest is better than that controlled by the provenance from the northeast. The favorable reservoirs of Chang 8 member are predicted, and it is considered that the reservoir in the northwest of Jiyuan Oilfield has great hydrocarbon potential.

Keywords: provenance, sedimentary facies, hydrocarbon accumulation, Chang 8 member, Jiyuan Oilfield, Ordos Basin.

INTRODUCTION

Jiyuan Oilfield located in the western Ordos Basin; tectonic units belong to the Yishan slope. Triassic Yanchang Formation is the main purpose of the oil and gas exploration in the area, combined with hydrocarbon source rock, reservoir and cap, wide exploration field. Yanchang Formation is divided into 10 reservoirs from bottom to top, followed by Chang 10-1 member, and effective hydrocarbon source rocks were found in Chang 7 member. Chang 8 member hydrocarbon accumulation is the proximal filling, recessive conducting, rapid aggregation, scattered, small-scale distribution, and accumulation mechanism is complex. Therefore, the accurate description of plane

distribution of sedimentary facies in Chang 8 member is the direct approach of study Jiyuan oilfield.

THE ANALYSIS OF SOURCE

We can analyse source by Heavy mineral, light minerals and rare earth elements.

Heavy mineral analysis

Heavy mineral properties are stable in sediments transport and deposition processes. The different mineralogical assemblages indicate the various metallogenic environments. So it indicates direction of sediment transportation [1]. The source area of Jiyuan Oilfield lied to the northeast and northwest.

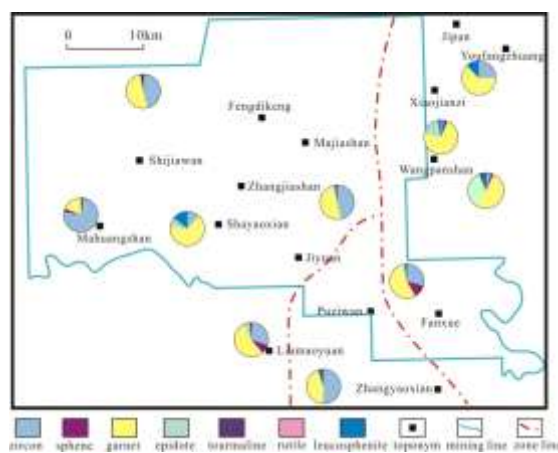


Fig-1: Characteristics of heavy mineral assemblage and its zoning map of Chang 8 member in Jiyuan Oilfield

Light mineral analysis

The main sandstone of Chang 8 member in the western and central oilfield is lithic sandstones and feldspathic litharenite, while the main sandstone of Chang 8 member in the eastern oilfield is lithic arkose and arkose. The difference of quartz, feldspar and lithoclast contents indicates the maturity of sediments, and reflects the distance from sedimentary center to source [2]. So Jiyuan Oilfield's west and east controlled by the different provenance.

Rare earth elements

Rare earth elements (REE) have similar chemical properties, lower solubility, and short detention time in water; therefore they enter fine-grained sediment quickly, making it less likely to separate. So fine-grained reflected actually the geochemical information in provenance.

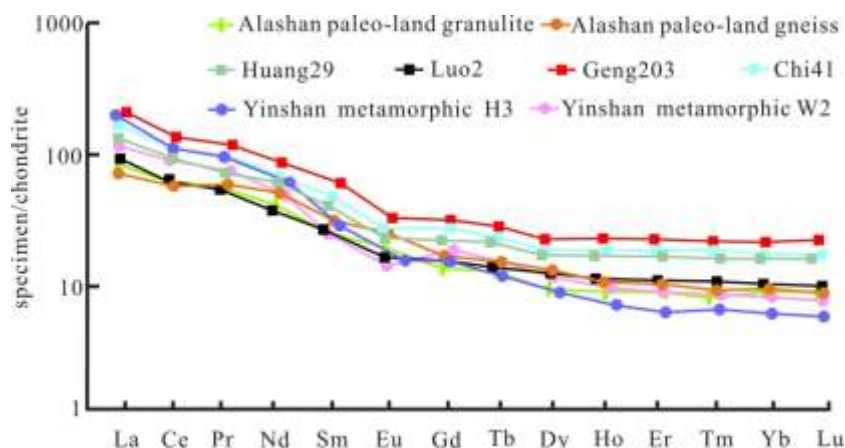


Fig-2: The comparisons of REE distribution pattern among Chang 8 member and the northwest and northeast of Ordos Basin

As a result of analysis, the distribution and evolution of sedimentary facies controlled by provenance from northwest and northeast, especially Alashan paleo-land in the northwest.

SEDIMENTARY FACIES

When drilling data is limited, the coring and logging data can be used to supplement seismic attribute analysis for the study of sedimentary facies. Delta plain facies and delta front facies chiefly exist from this area. The general sedimentary characteristics indicate that shore-shallow lacustrine deposits are the main types, while flood plain, delta and fan delta occurred mainly along the basin margin. The sand bodies located in distributary channel of lake facies delta plain and river mouth of delta front are favorable reservoir beds.

Through investigating a large amount of core data, the characteristics of fractures were described and recorded as log curves in detail [3]. Nevertheless, as a single sand unit is small in thickness and volume and the lateral variation is fast, it is difficult to identify this sand body with the traditional method. In literally, there shows the evolution trend from northeast and southwest distributaries channel sand to delta front far bar sand.

RELATIONSHIP BETWEEN SEDIMENTARY FACIES AND HYDROCARBON DISTRIBUTION

Ordos's basin is one of the largest continental sedimentary basins in Mesozoic of the central region in

China, Yanchang formation of Upper Triassic in Ordos basin is a major oil and gas department. Yanchang formation has oil in place accounting for 74.12% of the total reserve in the entire basin. The research of sedimentary facies and oil and gas gathering has a great significance in the oil and gas exploration. According to petrophysical property classification principle of this oilfield, such reservoir occurs extensively in this area, and is the focal target of future potential tapping.

The northwest and the northeast provenance was the important provenance district that had good inheriting characters and affected for a long time. It is vital difference for the changes of porosity and permeability between Chang 8₁ and Chang 8₂ member.

CONCLUSIONS

The distribution and evolution of sedimentary facies controlled by provenance from northwest and northeast, especially Alashan paleo-land in the northwest. It is very important for confirmation of the sedimentary source direction of Yanchang Formation to research the sedimentary facies of Yanchang Formation and direct the energy sources exploration.

Chang 8 member of Yanchang Formation in Jiyuan Oilfield are mainly delta sedimentary, and Lake Shoreline moving into northwest, experiencing delta plain to delta front.

The reservoirs in the study area are mainly delta plain distributary channel sand body and delta front underwater distributary channel sand body. Physical properties of the sand body of delta plain are better than delta front in Chang 8¹ member of Yanchang Formation in Jiyuan Oilfield, and physical properties of the sand body in northwest are better than northeast, and Sand body physical property in Chang 8₂ is much better than that Chang 8₁ layer. So, The northwest of Jiyuan Oilfield had better physical properties, and is the focal target of future potential tapping.

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