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The Research of source system on Chang 6_3 sand formation in Ansai oilfield

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Abstract: Through the analysis of the contradiction between the research results and the exploration of the sedimentary system of the former, it is believed that there is a lack of understanding of the source system in the north-east of Ansai area. In this paper, from the single factor, such as the color of mudstone, the distribution of carbonaceous mudstone, characteristics of heavy minerals, detrital component and the maximum particle diameter, the source system of Chang 6_3 sand formation in Ansai Oilfield are analyzed. Studies have shown that Chang 6_3 sand formation in Ansai Oilfield exists two different provenance system, which north-west region of sediment sources come from the northern provenance system, and sediment sources in the south-east region from north-east provenance system.

***Key words**: Ansai oilfield, Ordos Basin, provenance analysis, sedimentary system*

I. GEOLOGICAL BACKGROUND

The main oil exploration layer of Ordos basin is oil layer above Chang 6_2, oil layer below Chang 6_3 remains a low degree of prospecting. In the past, there are some researches on the layer below Chang 63 which from the aspects of reservior, oil and gas migration and accumulation in the Ordos Basin, and there are many blocks to build production. But due to lack of drilling data, the research degree is still very low.

Previous studies suggest that ansai areas mainly develop north-east source system, ansai area Chang 6_3 sand formations locate in delta front distributary channel of the north-east provenance system. Predecessors' research achievements can't explain the oil and gas that have founded in the north of ansai area. That may hinder the development of oil and gas exploration. Studies have showed that the paradoxical situation may due to ambiguous understanding about depositional systems, which can lead to insufficient understanding about distribution of oil and gas. Therefore, it is necessary to reacquaint depositional systems distribution of Chang 6_3.

II. SINGLE FACTOR ANALYSIS OF DEPOSITIONAL SYSTEM DISTRIBUTION

2.1 The color of mudstone

The color of the sediments has a close relationship with sedimentary climate and water depth. For sandstone, the color is determaint by the deposition climate, water depth and the characteristics of mineral components [1]. Under the humid climate, underwater sandstone shows grey or dark grey, but components of rock can make the color change. However, the potash feldspar sandstone is red, but in the process of diagenesis, due to the cement and filling fluid are different, the color of the sandstone is also different [2].

Comparing with sandstone color affected by many factors, the colors of the mudstone are mainly affected by sedimentary water depth and organic matter content [3]. In general, the color is light with shallow water depth and low organic matter content. In northern area of Ordos basin, overwater presents celadon, mottled gray or brown gray generally, underwater presents gray, half deep lake in dark grey to ash black. Ansai area mudstone in general is in three kinds of color: gray, dark gray and ash black. Dark gray and ash black often are difficult to identify, so it can be divided into two categories: gray, dark gray-ash black. On the basis of two types of color analysis, the every single layer of Chang 6_3 sand formation in Ansai area obviously can be divided into three color areas. Two gray areas distribute in the east and north-west of Ansai area, dark gray-ash black

area is located in the central and southern area (Figure1, Figure2).

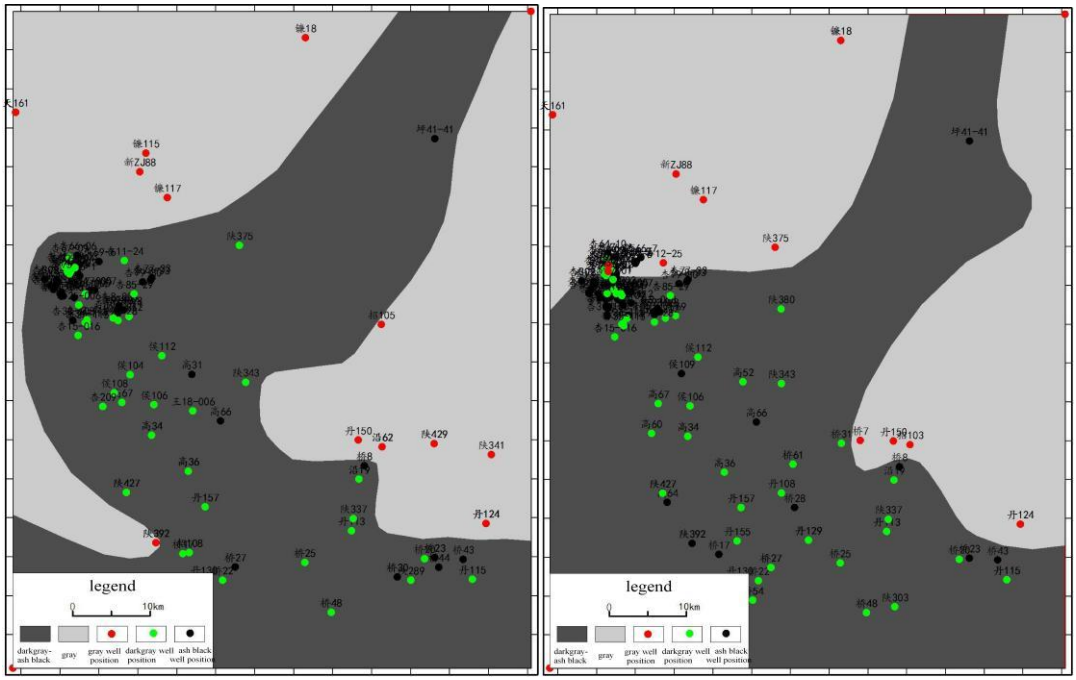

Figure1 The mudstone color of Chang $6_3^1$1 Figure2 The mudstone color of Chang $6_3^2$2

2.2 The characteristics of heavy minerals

From the analysis of characteristics of heavy mineral combination in this district, in ansai area, heavy mineral combination has two distinctly different characteristics [4]. One group predominantly takes reddish garnet and sphene as heavy mineral combination, namely the combination of faint red garnet, sphene, colorless garnet and epidote; another group is mainly composed of euhedral zircon and colorless garnet, namely the combination of euhedral zircon, colorless garnet, white titanium ore.

In ansai district, Chang $6_3^1$1 develops two kinds of heavy mineral combination (figure 3), areddish garnet, colorless garnet and euhedral zircon combination and sphene, epidote, reddish garnet combination.

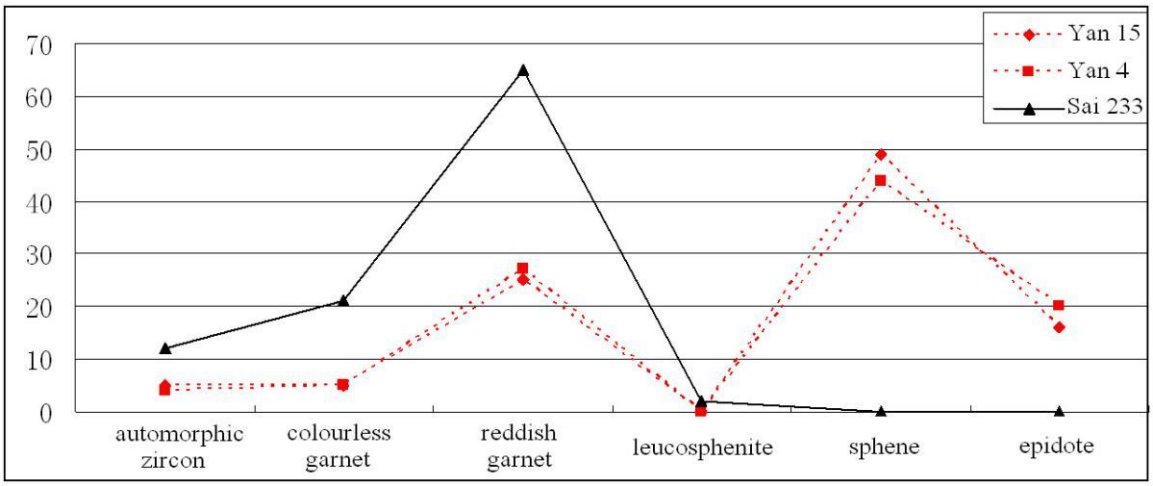

Figure 3 The heavy mineral combination of Chang $6_3^1$1

Chang $6_3^2$2 develops two kinds of heavy mineral combination (figure 4), pale red garnet, colorless garnet, sphene, euhedral zircon combination and euhedral zircon, colorless garnet, white titanium ore combination.

According to the characteristics of the heavy mineral combination in ansai area, it can be divided into two sedimentary systems [5]. The obvious characteristic of eastern source system is high content of sphene, but the western source system is high euhedral zircon content. According to the analysis of regional background, combined with the deep research of sedimentary facies, western sedimentary system is the northern provenance sedimentary system, while eastern sedimentary system is the north-east source of sedimentary system.

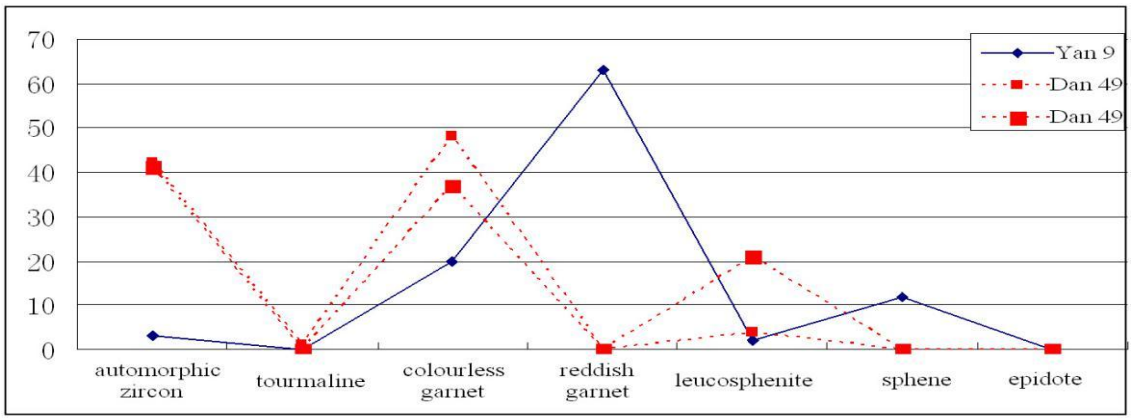

Figure 4 The heavy mineral combination of Chang $6_3^2$2

2.3 Clastic components

The characteristics of clastic components in the studied area are generally similar, but the content of highly metamorphic rock debris are obviously different [6]. From the plane distribution, highly metamorphic rock debris are developed in the south-east of ansai area, while in the north-west area are not. It indicates that north-west sediment source may be different from that in south-east [7].

From Chang $6_3^1$1 thin-section analysis data, we can see the differences between south-east and north-west highly metamorphic clastic components(figure 5), Chang $6_3^2$2 thin-section analysis data only distributes in the south-east, north west has no sample distribution, but south-east highly metamorphic rock debris samples develop (figure 6).

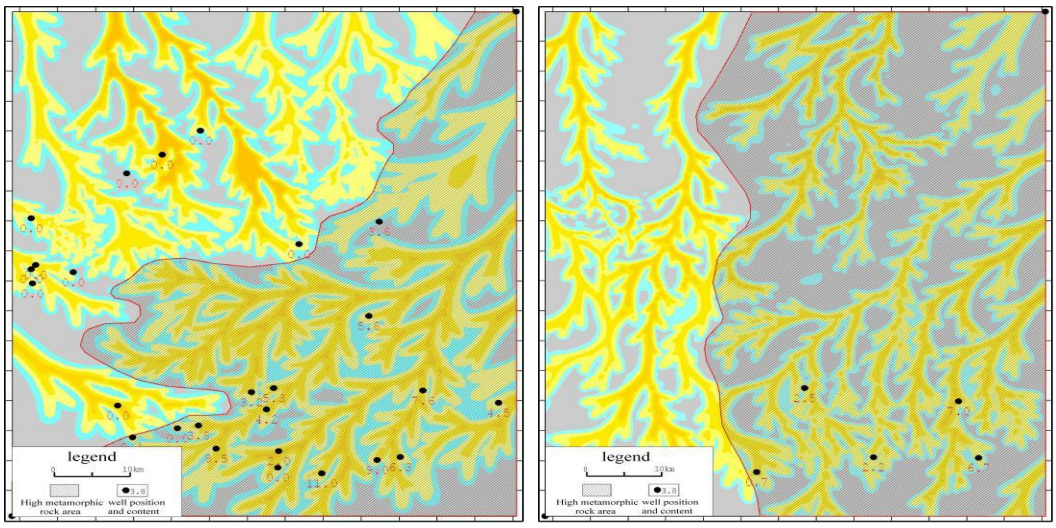

Figure 5 The highly metamorphic clastic components distribution of Chang $6_3^1$1

Figure 6 The highly metamorphic clastic components distribution of Chang $6_3^2$2

2.4 The distribution of largest particle size

The largest particle size of sandstone reflects hydrodynamic conditions, the hydrodynamic conditions are stronger; the maximum size of sandstone is bigger [8]. The weaker the hydrodynamic conditions, the smaller the sandstone maximum particle size. In general, the maximum particle size is large in the upstream area, but small in the downstream area. According to the analysis of maximum particle size, we can infer the direction of the river channel.

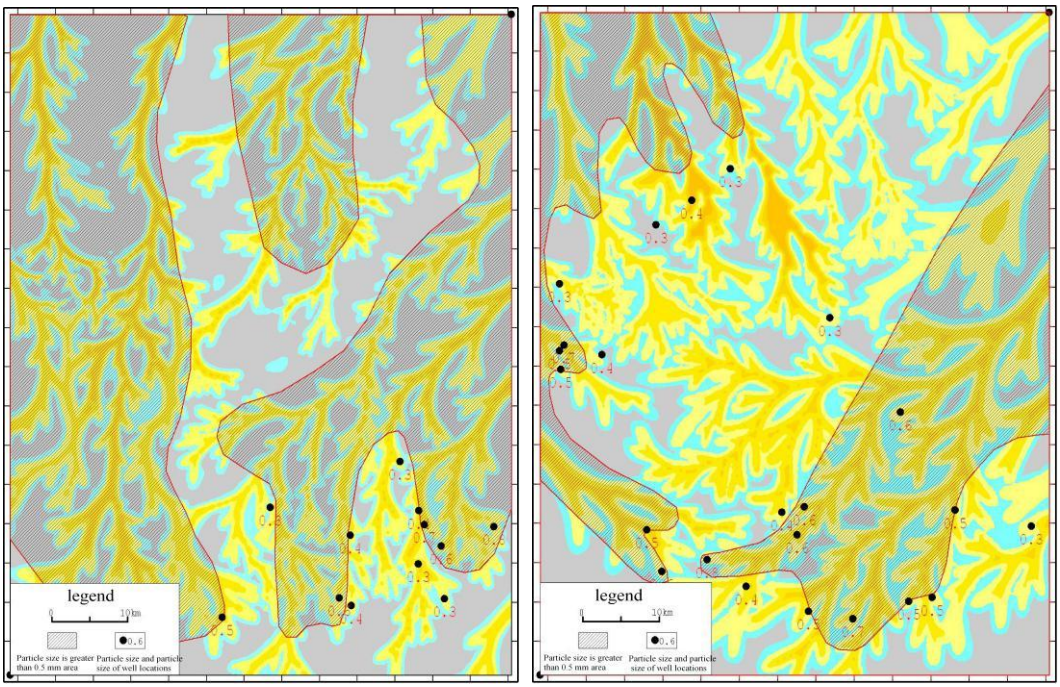

Figure 7 The maximum grain size distribution of Chang $6_3^1$1

Figure 8 The maximum grain size distribution of Chang $6_3^2$2

From the maximum size of the planar distribution analysis, the maximum grain size of Change $6_3^1$1 obviously showes two distribution trends, one distributes from north-west to south-east in north-west area, the other is from north-east to south-west in south-east area(Figure 7). The maximum size distribution of Chang $6_3^2$2 is not obvious, but it is similar to the distribution of Chang $6_3^1$1. So, from the maximum particle size distribution analysis, the Ansai area developes two depositional systems.(Figure 8).

III. CONCLUSION

Combined with the color of mudstone, heavy mineral characteristics and distribution, highly metamorphic rock debris and the largest particle size distribution, we could conclude that it develops north-west and south-east two source systems in ansai area. North-west area develops north provenance system, sedimentary system extends from north-west to south-east. South-east area develops north-east provenance system, sedimentary system extends from north-east to south-west.

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