Geological characteristics and genesis analysis of Iron ore in Early Carboniferous strata, West Kunlum

Chen Yang [1, 2, *], Hui Wang [2], Shaopeng Zhang [2], Youyun Liao [2], huan Liu [2]

[1.] State Key Laboratory of Continental Dynamics/Department of Geology, Northwest University, Xi'an, China
[2.] Aerial Photogrammetry and Remote Sensing Bureau of China Coal, Xi'an, China

*Corresponding author e-mail: yang-chen123@126.com

Abstract. West kunlun area have a new discovery of iron ore in Early Carboniferous on Tianshuihai block, the ore body is located near the anticlinal core of south the Aketahe river in the top of pasi group limestone formation. The element of Fe and Ti in ore reach the industrial grade and the ore quality is stable, which has high economic value. The discovery of iron ore containing titanium has enriched the deposit types of the west kunlun area, and it has a great significance for the study of regional metallogenic regularity and the breakthrough of prospecting.

Keyword: West Kunlun; Early carboniferous Pasi group; Iron ore containing titanium; Sedimentary type iron ore.

1. Introduction

West kunlun orogenic belt is located in the northwest margin of Tibet plateau and west segment of the central orogenic belt, where is also the combining site of Paleo-Asian Ocean tectonic domain, qinling-qilian-kulun tectonic domain and tethys tectonic domain [1-3], It is superior in metallogenic geologic condition and have a great prospecting potential. In recent years, lead-zinc mine [4] and rare metals [5-6] prospecting made an important discovery. The West kunlun area is a typical mountain canyon landform, which north is Kunlun mountain, and south is karakoram mountain, the west is connected with Pamir. the geology and mineral resources work is generally low in this area for the cold weather, lack of oxygen, steep terrain, sparse of the population and the extremely inconvenient transportation. In this study, Iron ore containing titanium was found in the early carboniferous pasi group at sourth of the aketahe river,and we study the geological characteristics and genesis of the Iron deposits.

2. Regional metallogenic background.

The investigation area is located in the combination of the two major tectonic regions of Paleo-Asian and tethys.Kang Xiwa–Subashi Ophiolite tectonic mélange belt as the boundary of Paleo-Asian tectonic domain in the north and the tethys tectonic domain in the south.The investigation area has a long geological history, where has a complex and diverse rock type, activity magmatism is superior in metallogenic geological condition.The nvestigation area is located in the Tethys metallogenic domain→bayankala-songpan metallogenic province, →South west kunlun Fe-Cu-Au-Pb-Zn-RM-Muscovite metallogenic belt→muzitage– akesaiqin Fe-Cu-Au-Pb-Zn-RM Mineralization

subzone[7],which is extented to pamir variscan metallogenic belt of Tajikistan, North to Kang Xiwa belt,and south to the karakoram fault.The Mineralization belt is an important belt in the west kunlun area which have a great geological background. And Metal deposits are known mainly for iron, gold and copper.

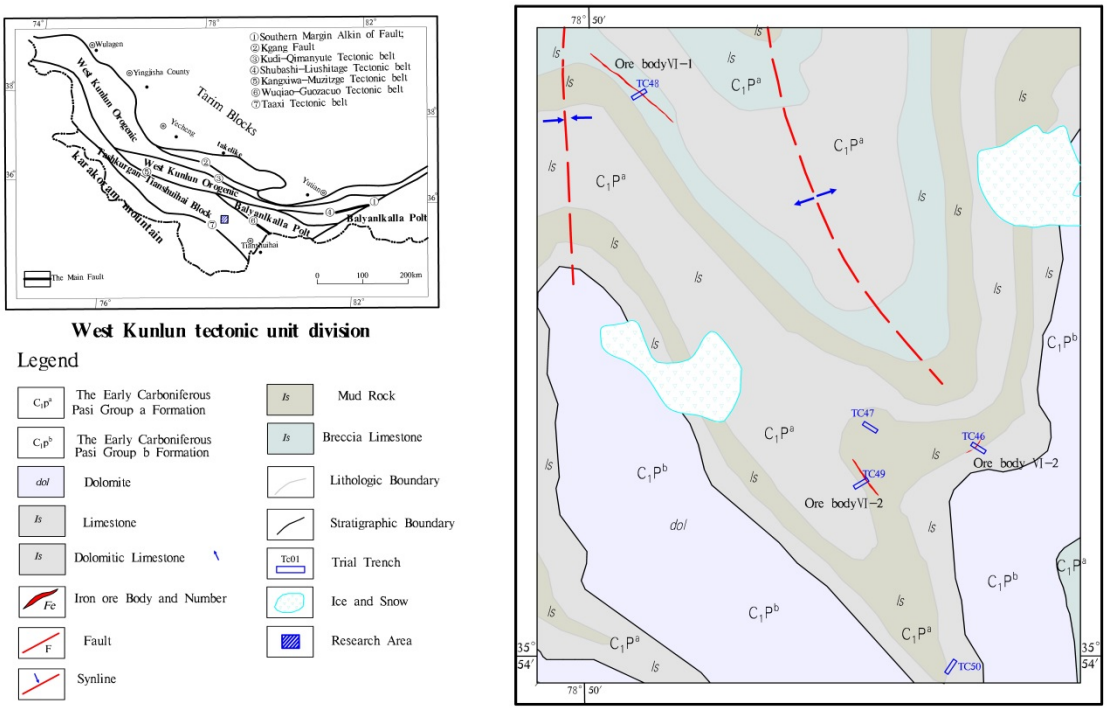

Fig.1 Map of regional geology and mineral

3. Geological characteristics of the mining area.

The investigation area is located in Tianshuihai block, where the basement is bulunkuole group of palepproterozoic, overlying strata including tianshuihai gropu of Changchengian Period; dongguashan grou of Ordovician; wenquangou group of Early Silurian; luoshigou group of Middle Devonian; tianshendaban group of Late Devonian; pasi group of Early Carboniferous; qiatier group of Late Carboniferous; and longshank formation of Early-Middle Jurassic, etc.ore-bearing stratum is pass group of early carboniferous; which deformation is strongly, fold and fault development, it is characterized by the double anticlinal structure which is inclined to the south (Fig.1).

3.1. Stratum

Pasi group is divided into three lithology formation from bottom to up, the lower part is limestone formation (formation a), the middle is dolomite formation (formation b), and the upper part is the clastic rock formation (formation c). The limestone formation (formation a) and the dolomite formation (formation b) were mainly Exposed rocks in the region, and the limestone formation (formation a) was the main ore-bearing layer in the region. The main lithology of limestone formation (formation a) from bottom to up is the dark grey thick layer Biodegradable microcrystalline limestone, Biohermal microcrystalline limestone, the Gray - yellow Fine grained calcarenite with wormkalk, oolitic limestone, marble, Dark red - black block of iron ore with titaniferous. At the top of the stratum is a grayish-gray micrite with bioclastic limestone. Overburden grey thick layer dolomite of formation b.

According to the characteristics of lithology and the fossil, it can be inferred that the limestone formation is generally formed in the shallow Marine carbonate platform. At the bottom, it is medium-thick layered bioclastic limestone, and the mainly fossils are coral polyps, and the second is sea lilies, brachiopods and axopods, etc., indicating the high-energy environment with shallow water and strong

wave action. With the biohermal limestone, it forms a shoal-biohermal sedimentary system Which indicates stable carbonate platform deposits. The upward fossils such as sea lilies, brachiopods and axopods showed the environment of shallow water and strong hydrodynamic force. In the top of stratum, stucco limestone and sandy calcareous limestone, wormkalk, and oolitic limestone reflect the alternating tidal flat environment under high energy and low energy tidal zone. And the magenta thin layer grained limestone indicates the tidal zone in the oxidized environment the limestone formation of Pasi group is forming A set of upward shallow sedimentary sequence from the bottom to the top.

3.2. structure

The deformation of the pasi group is characterized by the double anticline. The ore body and the surrounding rock are folded in the same period. For differences of the competent rock, the action of the interlaminar shear make the ore body to be more complex subprime inclined fold which controlled the spatial distribution of ore body. The development of fracture in local lot has destroyed the continuity of ore body to some extent.

3.3. ore body geological characteristics

We found three iron ore body in the study area (figure 1), ore body is like a layered clamping output in limestone, the floor-rock of ore body is silicide marble or wormkalk, roof rock is often wormkalk and oolitic limestone. The surface color of the ore area is dark purple and black, Because of hard and fragile ore body, the surface of ore area often forms the negative terrain such as puerto.

Ore body Ⅵ-1: located in the west wing of duplex anticline in south of aketahe river, a layered or layered bedding output. Go to NNW, incline to SWW, dip Angle is 35 °to 43°, ore body and surrounding rock produce form consistent, through surface tracing and exploration, the surface extends about 800 meters, and the thickness of the ore body is 12 meters, (FIG 2 A, B). The ore is dense with a large proportion. TFe grade up to 35.9%, the lowest is 29.65%, with an average of 33.3%, and TiO_2 up to 9.08%, with a minimum of 7.31 and an average of 8.05%.

Ore body Ⅵ-2: located in the hinge zone of duplex anticline in south of aketahe river, a layered or layered bedding output. Ore body with the surrounding rock occurrence drape, dip Angle is 38 °to 51 ° inclination, had abrupt contact relationship to surrounding rock. The surface is about 2000 meters long and the ore body thickness is 4 to 10 meters, he ore mineral mainly is hematite, which is a block-shaped aggregate division, the gangue mineral is mainly quartz and marble. There is no weak elongation in ore minerals. The ore is more complete, TFe grade up to 29.65% and a minimum of 13.9%. with an average of 22.97%; TiO_2 grade from 11.12% to 7.24%, with an average of 8.16%.

Ore body Ⅵ-3: located in the hinge zone of duplex anticline in south of aketahe river, iron-body reveals by trenching TC50, Mineralization of titanium and iron at contact part of limestone and diorite vein, TFe grade up to 27.9%, TiO_2 grade of 9.43%

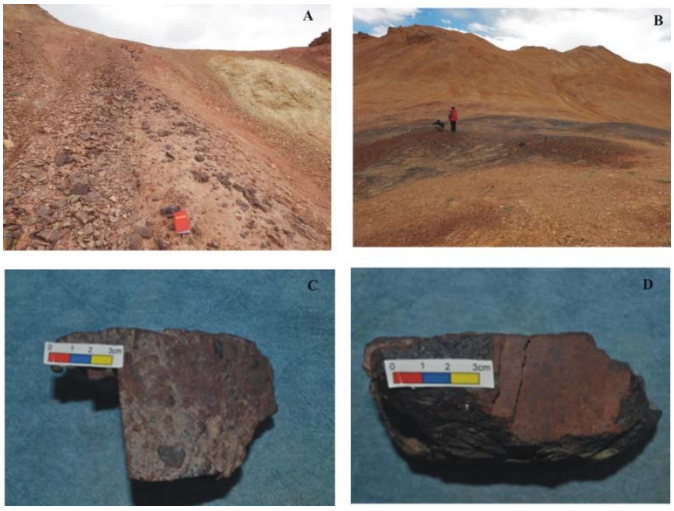

Fig. 2 Characteristics of iron ore body and ore

3.4. characteristics and quality of ore

The ore characteristics of different ore bodies are basically the same, the color of ore is often dark purple or black, a dense block structure, gravel support structure, matrix structure, base type cementation (figure 2 C, D), From the perspective of mineral structure, the ore mainly consists of two components: matrix and gravel. The gravel content is generally 30%, the gravel diameter is usually 2-5mm, which is medium, well rounded, and usually round - round.The ore minerals are simple, mainly composed of hematite and limonite, and gangue minerals are mainly calcite and other silicates. The ore body TFe and TiO_2 have high grade and low grade, and the ore quality is stable.

The analysis results of titanium Phase typy show that the main occurrence of Ti elements is rutile, titanite and other silicate titanium, a small amount of ilmenite and trace titanium magnetite. TiO_2 can be used to account for 5.2%, accounting for 68.5% (table 1), indicating that the available value of titanium element is higher.

Table 1 Analysis s of titanium Phase typy

Phase type	titanium in rutile	titanium in titanomagnetite	titanium in ilmenite	titanium in Titanite and silicate	The total amount
Content (%)	4.77	<0.01	0.43	2.4	7.6
Percentage (%)	62.8	0.0	5.7	31.6	100.0

4. Discussion and Conclusion

There are two main ore-controlling factors in the study area: (1) deposition conditions, Like most of sedimentary deposit, ore body originated in the Carboniferous Pasi group at the top of formation a, the lithology is mainly for the purple middle oolitic, lenticular limestone, in close association of with yellowish gray wormkalk. (2) structure conditions, the deformation of the Pasi group is strong, the complex anticline forms the characteristic structure of the region, the deposit and the surrounding rock are folded in the same period, and the original form of the deposit is changed. In addition, the fracture of local lot breaks the continuity of the ore body to some extent.

Iron ore body in the study area which is in top of the limestone formation shows a typical characteristic of stratabound. Iron ore are dense purple block structure, mainly for the oolitic structure or lenticular structure, ore bearing oolitic limestone always associated with grayish yellow thin layer wormkalk, It shows that the ore body is formed in the tidal flat environment with strong water dynamic

condition. The ore fabric indicates that the mineralization mainly comes from the land source debris injection. The ore-bearing material is grinding round and crushed under the frequent action of the tide. the large amount of iron, titanium and other elements are dissolved into the seawater to form the rich colloids. When the concentration of the element reaches a certain concentration, the elements form a concentric circular growth ring (FIG 2.D) around the different types of terrestrial debris. The other precipitates into the matrix form the titanium-rich iron deposits. Although the iron ore body is affected by the later tectonics, the whole shows the characteristics of layer control. Therefore, the iron ore deposit is a sedimentary iron deposit. This type of iron ore is a newly discovered type of deposit in west kunlun area. According to deposit type and geological characteristics of the ore deposit, this type of iron ore has a large scale, and also has a very good prospecting perspective.

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