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Geological characteristics and prospecting direction of typical gold deposits in West Junggar, Xinjiang

Yuan Liu

School of Resources and Environment, Henan Polytechnic University, Jiaozuo, Henan, 454000, China

992884916@qq.com

Abstract

There has been a great potential for prospecting in the western junggar region of xinjiang. Based on the basic methods and theories of common geology, deposit and geological geology, this paper analyzes the various geological information in the area of the western province of western xinjiang. The geological characteristics of the four typical gold deposits in the area are analyzed and analyzed. Finally, the research results are combined with the results of some achievements, and the mineralization information of the ore area is combined with the mineralization information analysis, and the prospecting results are summarized, and the prospecting for the mine is also inspired.

Keywords

West junggar area; Finding a clue; Mineralization; Geological information.

1. Introduction

For a long time, the global gold has been in short supply situation, the market gap. Unfortunately, the sharp decline in gold production in recent years has greatly exacerbated this tension. This is also the main reason why the price of gold is increasing. In this case, the importance of gold is self-evident. Gold mining is incomparable to China ' s economic benefits. The discovery of a large gold mine has brought great influence on a country ' s economy, international status and human society.At present, our country is in an important stage of the rejuvenation of the powerful country, whether economic or resource demand is growing. Up to now, a large number of gold deposits have been found in Xinjiang, and their reserves are conservatively estimated to be five times more than before. A large number of gold deposits have been found and identified in various types of mines in the prospecting process. By 2000, there were 72 gold deposits in Xinjiang. So we should strengthen the gold geological work to ensure that our country has sufficient gold reserves. The research on Western Junggar is to solve these problems in mineral resources. The discovery of some prospecting clues is not only of great significance to gold mining in China, but also of certain inspiration to peripheral prospecting.

2. Regional geological survey

2.1. Stratum

The strata in the survey area are mainly Carboniferous, followed by Devonian. There are occasionally Tertiary and Quaternary strata in piedmont or gully.

Devonian : It is distributed in the northwest of Hatu Mountain, with an outcrop area of about 65 square kilometers. The main lithology is grey, grey green, purple red, dark red mudstone, siltstone, fine-coarse sandstone, neutral lithic tuff, tuffaceous sandstone, rhyolite, siliceous rock, etc.

Carboniferous : It is distributed in the south of the Hatu Mountain, among which the Tailegula Formation is the most critical, the most widely exposed, and the most closely related to gold deposits. The Carboniferous is divided into Baogutu Formation, Xibeikulasi Formation and Tailegula Formation.

Tertiary : a small amount of distribution in the south of Hatu Mountain, small exposed area. The main lithology is brown red conglomerate, fine - medium grain argillaceous sandstone, etc.

Quaternary : distributed in piedmont and hilly low-lying areas, south also has a small distribution. The main lithology is gravel, sandy clay.

2.2. Structure

The structures in the survey area are mainly NE-trending, and the structural system is composed of a group of NE-trending large faults : Ballake fault, Mayile fault, Dalabute fault and Karamay-Uerhe fault. These faults are large and extend from north to south. In the south of Baogutu, the faults in this area are well developed and the structural system is mainly the Xibeikulas complex anticline and fault structure. Among them, fracture structure accounts for the majority. The surrounding rock mass is particularly obvious, but the scale is generally not more than 2.5 km. There are also dike filling parts, densely distributed, and closely related to gold mineralization, which is the main ore storage structure. Fracture fracture zone often accompanied by alteration, generally hydrothermal alteration. There are many typical gold deposits in the survey area, which are mainly composed of Darbut syncline, Darbut fault, Anqi fault and Hatu fault. The strong and complex geological structure and movement, old replaced by new superposition or intrusion phenomenon also laid a variety of complex geological phenomena in the survey area. It also provides favorable conditions for the formation and development of gold deposits.

2.3. Magmatic rock

(1) Basic basalt

The survey area is mainly basic basalt, followed by diabase and gabbro, and there are also plagioclase granite porphyry in the deep surface.

Among them, the basic basalt, diabase and gabbro do not have obvious boundaries in the overall transition state. Although they are the products of the same geological period, they are very different due to their different degree of crystallization and particle size in the mineralization process.

(2) Acidic rock-plagioclase granite porphyry

Since the magmatic rocks in the survey area are mostly located in the deep, their occurrence information is not clear. The minerals are mainly composed of dolomite, quartz, plagioclase and potassium feldspar, and a small amount of sericite, pyrite, arsenopyrite and ilmenite. Sometimes a small amount of chlorite, tremolite and apatite are mixed. Because of the alteration characteristics of pyrite, arsenopyrite and sericitization, these rocks are formed earlier than mineralized alteration and coincide with gold mineralization in space and time. Therefore, the acid rock activity is closely related to gold genesis. It is of guiding significance to study the prospecting direction of magmatic rocks and gold deposits.

3. Geological characteristics of typical gold deposits

Geological characteristics of four typical gold deposits in West Junggar, Xinjiang.

3.1. Sa I Gold Deposit, West Junggar, Xinjiang

The gold deposit is located in the upper northeast end of the Dalabute fault. About 14 km to the northeast is the Salto Sea fault. The main areas controlling the Sa I gold deposit are on two sets of secondary faults, one in EW direction and the other in NE direction, which are developed on

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both sides of the fault and on the stratigraphic boundary. The late faults have two groups of NW and NE, which affect and destroy the early faults. These faults are multistage, superimposed on mylonite fossils, magnesite by varying degrees of dynamic metamorphism[1].

The gold veins are distributed in the Dalabute ophiolite belt. The genesis of gold deposits is complex and closely related to many factors. For example, when serpentine transforms into carbonate talc schist or quartz magnesite, quartz magnesite is sheared and gold mineralization occurs. Moreover, gold mineralization is also closely related to serpentine and other rocks. The Lower Carboniferous volcanic sedimentary formation is the ore-bearing strata in the region.

The vein of SaI gold deposit is mainly altered rock type, but there are also a small amount of quartz vein type, mostly are cut by quartz vein type ore body. Metamorphic rock type ore body refers to the gold-bearing mylonite quartz- magnesite alteration, quartz- magnesite recrystallization quartz, magnesite and new chromium mica formed mylonite schistosity in the process of mylonite. The metasomatic alteration and mineralization occurred in the foliation of mylonite in the shear zone, forming quartz-carbonate-pyrite assemblage and gold-chromite-mica-quartz-carbonate assemblage, and extending in veinlet parallel to the foliation of mylonite. The quartz vein type ore body is composed of quartz vein and its branch quartz carbonate vein. The quartz vein is milky white and penetrates the sedimentary surface of a quartz magnesium variety of mylonite at a large angle.

Through the study, the mineralization in the survey area is mainly divided into five stages : pyrite-quartz-carbonate stage, natural gold-arsenite-chromite stage, pyrite-carbonate-quartz stage, natural gold-sulfide-quartz stage and carbonate stage.

After multiple crushing and washing, the samples were determined by inductively coupled plasma mass spectrometry. The results show that compared with other metallogenic hydrothermal stages, the natural gold-sulfide-quartz stage is formed in a relatively reduced metallogenic environment. It is closely related to the formation of gold deposits.

chalcopyrite, galena, sphalerite, pyrite, arsenate and silver-bearing natural gold are the main mineral components. Quartz and muscovite are the main gangue minerals, and a small amount of carbonate minerals.

The Baobei gold deposit is located in the contact zone between the super bedrock and the basement volcanic rocks at the northeast end of the Dalabute ophiolite migmatite belt in Western Junggar, Xinjiang. Around the mining area, formed about 800 meters wide and low terrain ophiolite melange belt, to the northeast.

The wall rock alteration mainly includes silicification, carbonation, basaltization, chloritization, serpentinization and quartz magnesiteization to form gold-bearing alteration. In this process, a large number of minerals are enriched, which are not only pyrite and chalcopyrite ; there are also a small amount of toxic sand and other minerals.

There are mainly two types of ore bodies, but the main object of mining at present is the gold-bearing mylonite fossil brucite. This type of ore body has natural gold, chalcopyrite and pyrite, gold quartz vein is natural gold sulfide quartz vein.Summary see Table 1.

Table 1: Geological characteristics of Sa I gold deposit

Deposit name	Sa I Gold Mine
Scale of deposits	Large
Geotectonic position	Upper plate of northeast end of Dalabute fault
Ore-bearing strata	Lower Carboniferous volcanic sedimentary formation

Ore-controlling structure	EW and NE secondary faults	
Ore-bearing rocks	Quartz magnesite, serpentine and talc magnesite in ophiolite melange	
Main ore minerals	Natural gold, chalcopyrite and pyrite	Sulfide, natural gold
Main gangue minerals	Quartz, muscovite and a small amount of carbonate minerals	Quartz, muscovite and a small amount of carbonate minerals
Types of gold minerals	Natural gold	Natural gold
Wall rock alteration	Silicification, carbonation, basaltization, chloritization, serpentinization, quartz magnesiteization	Silicification, carbonation, basaltization, chloritization, serpentinization, quartz magnesiteization
Gold-bearing minerals	Quartz, serpentine, pyrite and quartz magnesite	Quartz, pyrite and serpentine
The output form of gold	Gap gold and parcel gold	Quartz Encapsulation, Quartz Particles and Mineral Fissures
Main ore minerals	Natural gold, chalcopyrite and pyrite	Sulfide, natural gold

3.2. Baogutu Gold Mine

The tectonic movement in this area is strong, and there are many faults, mainly the Dalabute fault zone, and the mining area is located in the south. The distribution of gold deposits is mainly controlled by Anqi, Dalabute and Hatu faults, which have a common feature that they are all northeast.

The main strata in this area are volcanic-sedimentary rocks of Lower Carboniferous, and gold deposits mainly occur in the strata. Among them, the Xibekulasi Formation is the direct ore-bearing strata in the Baogutu gold mining area. The main ore-bearing rock in this area is tuffaceous sandstone. Above this stratum is Baogutu Formation, and then up is Tailegula Formation .

Gold is produced in various forms, but there are mainly two kinds : crystal gap gold and wrapped gold.

Magmatic rocks are widely distributed in the region, and the characteristics of magmatic rocks on both sides of the Dalabute fault are very different.

Rock-based granites are distributed on the northern side of the fault zone, and there are many types of rocks. However, they usually have high alkali content and silica content, which are derived from the underground depth. The intrusive age is about 230 Ma – 275 Ma, and the alumina content is high. Such as Hatu rock, Miaoergou have these characteristics. The rock mass is mostly alkali feldspar granite and a small amount of monzonitic granite, which is the main reason for the existence of the above common characteristics.

Quartz diorite porphyry and granodiorite porphyry are distributed in the south of the fault zone in the study area. They are concentrated together to form a small rock distribution of less than 5 square kilometers, which are quartz diorite[2].

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The veins of Baogutu gold deposit are mainly quartz veins. Controlled by the northeast fracture. The longest extension can reach 400m and the width can reach 8m.

Wall rock alteration mainly includes silicification, pyrite and arsenopyrite. Gold mineralization is closely related to quartz diorite.

The main mineral assemblages of ore bodies are pyrite, arsenopyrite and natural gold. The gangue minerals include quartz, chlorite and calcite.

The types of ore bodies are mainly quartz vein and net vein. Quartz vein type ore bodies are generally milky white, because the main components of the ore body are quartz thick veins and quartz carbonate fine veins.Summary see Table 2.

Table 2: Geological characteristics of Baogutu gold deposit

Deposit name	Baogutu Gold Mine	
Mineralized element combination	Au-Cu	
Scale of deposits	Large	
Geotectonic position	South wing of east segment of Zaire-Dalabute syncline, Hercynian	
Ore - bearing strata	Lower Carboniferous Baogutu Formation	
Ore-controlling structure	Near SN and EW secondary faults	
Ore-bearing rocks	tuffaceous sandstone of Baogutu Formation	
Type of ore body	Quartz vein type	Quartz net vein type
Main ore minerals	Pyrite, arsenopyrite, arsenopyrite, natural gold	
Main gangue minerals	Quartz, sericite, iron dolomite, siderite, calcite	
Types of gold minerals	Natural gold	
Wall rock alteration	Silicification, sericitization and carbonation	
Gold-bearing minerals	Quartz, pyrite and arsenopyrite	
The output form of gold	Gap gold and parcel gold	
Metallogenic temperature	230 – 350 °C	

3.3. Hatu gold deposit

The gold ore bodies of the Hatu gold deposit mainly exist in the large fault structure developed on the upper plate of the Anqi fault north of the Anqi fault and south of the Hatu fault. In particular, the fault structures in the northwest, near east-west, northeast and northeast directions are all ore-bearing structures[3].

In addition to the exposed Quaternary caprock, the bedrock is mainly composed of the Lower Carboniferous Tailegu Formation and the Baogu map dominated by volcanic tuff. There are four NE-trending faults, which constitute the basic tectonic framework. From north to south, Heisu, Hatu, Anqi and Darbut faults are in turn.

Gold occurs in various forms, both in the form of ions and in the form of inclusion gold. In addition, it can also occur in cracks or lattice gaps.

Occurrence minerals can be divided into two categories according to the depth of minerals in the underground and the type of ore body : in the shallow underground, the main gold bearing mineral of quartz vein type ore body is quartz ; in the deep underground, pyrite and arsenopyrite are the main gold-bearing minerals when the ore body type is altered rock type[4].

The main types of ore veins are quartz vein type and altered rock type. The former is mainly lenticular or veinlet in the fault zone, generally in the shallow part. The latter is mainly veinlet infection, located in the deep. Most of the veins are initially exposed to the surface, with a number of branches and combinations. Space is echelon.

Through research, different fluid sources of these two types of veins are the main reason for different types of veins. The mineralization of gold-bearing quartz vein type ore body is related to granite magmatic hydrothermal fluid, and the action of deep ore-forming fluid affects the occurrence of gold-bearing broken altered rock type ore body[5].

The Hatu gold deposit is a medium hydrothermal gold deposit. The ore-forming fluid contains rich sodium ions, potassium ions, sulfur ions, fluoride ions, carbon dioxide, methane and other gases. It shows that the ore-forming fluid has magmatic origin. The content of carbon dioxide and methane gas in rich ore body increases, and the content of carbon dioxide and methane gas in poor ore body decreases. The characteristics of inclusion indicate that the mineralization process is controlled by tectonic compression.

The source of ore-forming fluid through previous studies and the current collection of data analysis concluded that the fluid is mainly derived from the deep, because the inclusion gas phase has nitrogen and carbon dioxide and other gases from the mantle, so the fluid should be closely related to magmatic rocks. This also shows that the deep part of the ore body is still worth mining and has good prospecting prospects.

The ore minerals of Hatu gold deposit are mainly quartz, pyrite, arsenopyrite and natural gold. The gangue minerals are mainly quartz and calcite.

Baby gold deposit is located about 30 km east of Hatu gold deposit, which is located in the same stratigraphic unit as Hatu gold deposit. Gold mainly exists in a group of Carboniferous volcanic - sedimentary strata. The mineralization of Baby gold deposit should occur after the formation of acidic tuff, which may be in the late Carboniferous. Baby gold deposit is quartz vein type.

The main alteration phenomena in the investigation area are pyritization and silicification, which run through all the typical gold deposits in this study and can be used as important prospecting clues. In addition, the deposit also has a small amount of sericitization.

There are two main types of ore bodies in the survey area : one is quartz vein type, which is mostly extended along faults, branches are distributed in bifurcation, and there are also complex phenomena. The color is milky white or gray ; the other is altered rock type, which can be independently veined. The distribution boundary of these two types of ore bodies is obvious in the survey area, with the former in the upper half and the latter in the lower half.Summary see Table 3.

Table 3: Geological characteristics of Hatu gold deposit

Deposit name	Hatu Gold Mine
Mineralized element combination	Au ~ Cu
Scale of deposits	Large
Geotectonic position	North wing of east segment of Zaire-Dalabute syncline, Hercynian
Ore-bearing strata	Lower Carboniferous Telgula Formation
Ore-controlling structure	NE-trending secondary fracture
Ore-bearing rocks	tuff and basalt of the Tailegula Formation

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Type of ore body	Quartz vein type	Alteration rock type
Main ore minerals	Pyrite, arsenopyrite, natural gold	Pyrite, arsenopyrite, natural gold
Main gangue minerals	Quartz, sericite, calcite and iron dolomite	Albite, quartz, siderite and iron dolomite
Types of gold minerals	Natural gold	Natural gold
Wall rock alteration	Silicification, sericitization and carbonation	Silicification, pyrite, arsenopyrite and carbonation
Gold-bearing minerals	Quartz, pyrite and arsenopyrite	pyrite and arsenopyrite
The output form of gold	Gap gold and parcel gold	Gap gold and parcel gold
Metallogenic temperature	200 – 360 °C	200 ~ 350 ° C

3.4. Tyil Gold Mine

The Tiyier gold deposit is located in the Zaire-Dalabute syncline of the Junggar boundary mountain fold belt. The fault is well developed in Tuoli County, which has rich mineral types. The geological structure is located in Zaire-Dalabute syncline of Junggar-Jieshan fold belt. The main fault zones are the large-scale fault zones of Hatu, Anqi and Dalab, which are roughly parallel to the NE direction of the main tectonic line in the region, and the distribution is from northwest to southeast, which controls the distribution of most gold in the region.

The strata exposed in the survey area are mainly the Taylorgula Formation, belonging to the lower Carboniferous period. Mainly visible neutral tuff, gray color ; there are also a small amount of sandstone. Followed by a small amount of Quaternary strata.

Above the above strata is the Baogutu Formation, together constitute the survey area of Carboniferous and Xibekulasi Formation, at the top. The main sedimentary formation in the survey area is the semi-deep-continental volcanic sedimentary strata with great thickness. These strata are located on both sides of the large fault zone, and the magmatic activity in the survey area is strong[6].

Ore bodies are mainly hosted in Anshan shale, and the hosting mechanism of minerals is iron mineralization.

After research, the ore in the survey area is mostly altered rock type.

The most common components of these minerals are pyrite, quartz and chlorite, and sometimes a small amount of arsenopyrite, natural gold and galena. Surrounding rock alteration is strong, the most common is pyrite and silicification, as well as carbonization. Secondly, a small amount of potassium can be seen, which is closely related to the genesis of gold deposits.

Most of the ore bodies in this area are between 270 Ma and 330 Ma, including Hartutoxi rock mass and Miaoergou rock mass, and a small amount of Hongshan rock mass. Due to the good development of the fault, there is a ophiolite belt around it, just north of the fault zone.Summary see Table 4.

Table 4: Geological characteristics of Tiyer gold deposit

Deposit name	Tyil Gold Mine
Scale of deposits	Large
Geotectonic position	Zaire-Dalabute Synclinorium in Junggar Border Mountain Fold Belt
Ore-bearing strata	Carboniferous Group

Ore-controlling structure	NEE to the Hutu, Anzi and Dalab Fault Zones
Ore-bearing rocks	Neutral tuff, Baogutu Formation and Xibekulasi Formation of Talgula Formation
Type of ore body	Hatuxi rock mass and Miaoergou rock mass, as well as a small amount of Hongshan rock mass
Main ore minerals	pyrite, quartz, chlorite, arsenopyrite, natural gold and galena
Main gangue minerals	Quartz and carbonate minerals
Types of gold minerals	Alteration rock type
Wall rock alteration	Pyritization, silicification, carbonation and potassium
Gold-bearing minerals	Pyritization andesitic porphyrite rock mass
The output form of gold	Gap gold and parcel gold

4. Conclusion

1. The tectonic and magmatic hydrothermal activities in the survey area are frequent, and it is also the high background area of gold, which is very beneficial to the formation of gold deposits. Because in the study of the four typical gold deposits in the Carboniferous Baogutu group and theTelegula group as ore-bearing layer, or source layer are frequent, so can be used as a direct prospectingdirection. The upper plate of the Anqi fault north of the Anqi fault and south of the Hatu fault developed into a large fault structure, and these tectonic activities provided a good ore-bearing space for the formation of gold deposits. It is not just ore-bearing space, whether providing heat sources, ore-conducting channels or providing gold-carrying fluids, etc., that can highlight the key of these tectonic activities. Around these tectonic belts are favorable areas for gold mineralization.

2. Through the study of four typical gold deposits, it is found that there are many coincidence points in the alteration phenomenon, and silicification, pyritization and carbonization occur most frequently ; hatu and Baogutu gold mineralization are closely related to sericitization and arsenopyrite ; the gold deposits are occasionally accompanied by potassium mineralization and chloritization. These alteration phenomena can be used as a guiding direction in the future work of gold deposits. After various comparisons, the following common gold-bearing minerals are obtained : quartz and pyrite are the most common, which can be used as the main prospecting indicators ; in addition, arsenopyrite often occurs in some gold deposits, as well as basalt, quartz magnesite, etc., which can further indicate prospecting work.The area with frequent volcanic activity is the prospecting indicator.

3.In terms of ore-forming fluid, the study shows that the ore-forming fluid is mainly derived from deep underground and mainly due to magmatic origin. The fluid is generally rich in Na +, SO42- and K + plasma, so paying more attention to these special ions in the prospecting process has guiding significance for prospecting work.

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