San Du, Guizhou Miao Long gold deposit mine is located in China's famous "Yunnan-Guizhou-Guangxi" Golden Triangle area. Tectonic location was a southern Taiwan the Longnan edge-Youjiang Rift northern margin of the Yangtze Block (Li Hongyang, 2002).

The ore bodies of Miao Long gold deposit were hosted in limestone intercalated with marlstone rock of Upper Cambrian San Du Formation. The gold ore bodies were strictly controlled by the Fault Fm1 and Fault Fm14. The orebodies were mainly outputed as lenticular, leguminous, saccular and veiny. The ore structure mainly was densely disseminated structure, sparse disseminated structure, banded and vein structure. The ore texture mainly was as lenticular, leguminous, saccular and veiny. The ore structure mainly was densely disseminated structure, sparse disseminated structure, banded and vein structure. The ore texture mainly was fine particles pentagonal dodecahedron, cube crystal texture, zoned texture, columnar texture, acicular texture, collection of the radiation texture, strawberry texture. Gangue minerals mainly were quartz (chalcedony), iron, dolomite, calcite, hydromica, followed by barite, fluorite. Wang Xiujing (1982), Zhang Yuanqing (1986) holded that there was native gold in MiaoLong Gold Deposit metallic minerals. However, the results of ore microscope, electron probe microscopy observation showed that there was't natural gold particles in the minerals. The metallogenesis of this deposit can be divided into 3 stages that is diagenetic stage, hydrothermal mineralization stage and Supergene oxidation stage. Arsenopyrite was one of the essential product of hydrothermal mineralization stage.

1 The arsenopyrite mineral characteristics and EMPA test analysis results

Arsenopyrite was one of the important product of the main stage of hydrothermal mineralization, was predominantly starrily distributed over sparse disseminated or dense disseminated ores. under Mineralogical microscopic, arsenopyrite is characterized by milk bright white, its double reflection and reflection pleochroism were not obvious, and its Anisotropic properties were significant. In incomplete orthogonal polarizing. Arsenopyrite’s polarizing color was brown yellow - gray-blue, and dispersion were significant in convergent orthogonal, DAR (rotary dispersion) = v> r, DRR (reflected as the rotation dispersion) = v> r, Ps ="-". Arsenopyrite had varied shapes, primarily in a diamond shape, needle-like, columnar and radiation columnar aggregates, partial zonal structure, was distributed over the gangue minerals or fractures associated with pyrite, stibnite, or metasomatism of pyrite or metasomatism by stibnite or parcels. Arsenopyrite particle size range of was 0.001 ~ 0.13mm (1 ~ 130 μm), Principally 0.01 ~ 0.05 (10 μm ~ 50 μm),with mineral characteristics of epithermal deposits. In addition, the mineral had the activation recrystallization trend by late silicification, then it was enriched in silicified argillaceous carbonate or breccia which was to be appearance as the band or radial aggregates. Therefore, the gold was positively correlated with arsenic, the arsenopyrite can be used for a indicator mineral of gold.

Using electron microprobe analyzer (EMPA) and scanning electron microscopy (SEM)to insight the content of Fe, S, Au, As, Sb, and other elements of arsenopyrite, there was no natural gold particles. The content of gold was 0.05%~0.14%, with an average of 0.06%. The main elemental composition of arsenopyrite is more stable, the content of Fe was 32.47% to 35.71%, with an average of 34.05%; the content of S was 21.01% to 26.38% with an average of 23.13%; the content of As was 38.50% to 44.73%, with an average of 41.86%. S/As atomic percentage range of was 1.10 to 1.56, the components of arsenopyrite(FeAs0.80S1.17 ~ FeAs1.02S1.21), that was deviated from the theoretical arsenopyrite components (Fe As1.12 S1-x ≤ 0.13) was characterized by epithermal that was rich in S and lack of As which what Can be used

In trace elements, The arsenopyrite was rich in gold, the content of gold was 0.05% ~ 0.14%, with an average of 0.06%; the content of BI values were below the detection limit, Ni, Ag, Hg, Cu, Pb and Zn in only a small amount of The data were above the detection limit, and Sb, Co and Se in the vast majority of values were above the detection limit.

2 Gold occurrence of gold-bearing mineral arsenopyrite

The major feature of the Carlin-type gold is Gold was "invisible gold " in the form. But the existence of the invisible gold, if it exists, it is based on microscopic or the microscopic inclusions gold form or the existence of lattice Gold form (isomorphic) ? Su Xindong (1991) has studied shown, through BanQi, MiaoLong and other micro-disseminated gold deposit contained gold minerals in Guizhou province of China. The major existence of three forms gold were sub-microscopic gold, isomorphous gold and colloid adsorption. Zhang Gaomin (2009) idem, the gold minerals < 2um embedded distributed in the carrier mineral arsenopyrite and pyrite in the MiaoLang gold deposits ore. Wang xiuqing(1982) and Zhang yuanqing(1986) thank that gold distribution in the form in MiaoLong gold deposits was major microscopic native gold, microscopic times round granular- round granular wrapped body gold form or solid solution of gold in the form, among Microscopic native gold is mainly distributed in the quartz intergranular; wrapped body gold mainly distributed in pyrite and arsenopyrite; Solid solution of gold is mainly distributed in the radial structure of arsenopyrite aggregate, micro- crystalline strip arsenopyrite; The existence form of gold in the Arsenopyrite may exist in the form of a solid solution.

The results of EMPA measuring point showed that the content of Au was 0.05% to 0.140%, was equivalent to the content of the trace elements isomorphous range, and didn’t find a high content of Au it was’t impossible to exist in the form of " ultra - microscopic inclusions in arsenopyrite ( Sun Jimao, 2005 ). Wu Xiuqun (1983 ) didn’t found a rich region of independent gold mineral in Guizhou Sandu gold deposit observed in the ore microscope and scanning electron microscopy X-ray scan, that the Au was formed as chemical state in arsenopyrite in the area.

It didn’t found a rich region of independent gold mineral by Observed the polished section of the MiaoLong gold deposit in the ore microscope, electron probe microanalysis and high-powered scanning electron microscope scanning, it showed that the particles of Au was not greater than 0.05μm ( n × 100A ° ) in arsenopyrite ( Sun Jimao , 2005 ; Bao Zhenxiang , 2005 ).Based on the analysis of electronic probe point, selected a representative arsenopyrite to sweep the surface of Fe, S, As, Au and Sb element.

As can be seen from the surface scintigram, surface scintigram of S element in Arsenopyrite is the brightest, followed by Fe element which is clear in the edge. The brightness of As element is weaker and its distribution is more homogeneous. Sb distributes only in the fissures of arsenopyrite. The brightness of Au elements is minimum and only its outline is faintly visible.However,its distribution is homogeneous and no bright spots. R is not present in the form of ultra-microscopic gold particles arsenopyrite. That illustrates Au is not present in the arsenopyrite with the form of ultra-microscopic gold particles. After the surface scanning research of arsenic sulfide, Zhang Fuxin(1999) finally discovered that Au and Ag uniform distributed in arsenopyrite and pyrite, which indicate that the occurrence sate of gold was chemical state gold(Au+).Wang Kuiren (1992) using micro beam technology such as The proton probe analysis and scanning electron microscopy (sem) to study the Jinya Carlin-type gold deposit, the result show that the gold distributed uniformity in the deposit and existed in the form of lattice gold.According to the research which four gold deposits were studied by Cabri in 2000, the result which gold points were distributed evenly in arsenopyrite shows that gold occurs as chemical combination in ores. We can obtain the similarly point of view which is consisten with the former analysis results, that gold mainly occurred in arsenopyrite as chemical state gold(solid solution of gold).

Conclusion

Arsenopyrite was one of the essential product of hydrothermal mineralization stage, which was produced in rhomb, acicular, columnar and radiated aggregation. The content of gold was 0.05% ~ 0.14%, with an average of 0.06%. The main elemental composition of arsenopyrite is more stable, the content of Fe was 32.47% to 35.71%, with an average of 34.05%; the content of S was 21.01% to 26.38% with an average of 23.13%; the content of As was 38.50% to 44.73%, with an average of 41.86%. The components of arsenopyrite(FeAs0.80S1.17 ~ FeAs1.02S1.21), that was deviated from the theoretical arsenopyrite components (Fe As1.12 S1-x), that was deviated by epithermal that was rich in S and lack of As. The arsenopyrite was rich in gold, the content of gold was 0.05% ~ 0.14%, with an average of 0.06%. Au was uniform distributed in the SEM figure, indicated that Au was existed in the arsenopyrite in the shape of Lattice gold (Solid solution gold).