The Guilaizhuang gold field is a very important gold field found in western Shandong. The deposits distributed in this ore field occur mainly in the Yanshanian metalkalescence volcanic complex and were characterized by the rich tellurides, represented by Guilaizhuang gold deposit. It is generally accepted that Guilaizhuang deposit is an epithermal gold deposit of Te-Au type related to Tongshi alkaline subvolcanic rocks and is controlled by crypto-explosive breccias (Lin et al., 1997; Shen et al., 2001; Zhou et al., 2002; Bondarenko et al., 2005; Tan et al., 2012; Yang et al., 2014; Yu et al., 2014). This article describes the main features of the ore-forming fluids, the metallogenic materials, the temperature and pressure, the metallogenetic epoch, and the metallogenesis in Guilaizhuang gold deposit as well as advances in the research and development of this deposit in recent years.

1 The Ore-Forming Fluids: Characters and Source Materials

1.1 The composition of ore forming fluid.

The fluid inclusion study in gold-quartz veins and in fluorite of breccia ores shows that the ore fluids consist dominantly of H$_2$O that contains Na$^+$, K$^+$, Ca$^{2+}$, Mg$^{2+}$, CO$_2$, F, Cl, CH$_4$, H$_2$S with trace amounts of N$_2$, Fe$^{3+}$ (Shen et al., 2001). The investigation on fluid inclusions in fluorite shows that the ore-forming fluids were CO$_2$-rich mixed hydrothermal solutions of multiple sources. It is concluded that the fluid forming this type of copper-gold deposit is one high oxygen and sulphur fugacity and low-to-moderate temperature acid fluid. Based on review a number of materials of gold ore deposits, it may be suggested that the migration of gold is mainly in the form of colloform, simple haloids, different complexes and mechanical form.

1.2 The property of ore forming fluid.

In some large and high grade lodes, the temperature of the quartz fluid inclusions vary greatly (130~330 °C), and so does the salinity of fluids (0~20wt.% NaCl eq.). The homogenization temperature and salinity of ore-forming fluid show some regularity at space, indicating that ore-forming fluid flow has directivity. During the three stages of metallogenic process: the high-temperature stage (Temperature: 310-330 °C, salinity: 1.65-5.17 wt.% NaCl eq. and density: 0.66-0.75 g/cm$^3$), the middle-temperature stage (Temperature: 200-270 °C, salinity: 5.00-10.00 wt.% NaCl eq. and density: 0.82-0.94 g/cm$^3$) and the low-temperature stage (Temperature: 130-150 °C, salinity: 5.00-20.00 wt.% NaCl eq. and density: 0.95-1.08 g/cm$^3$), the salinity and density of fluids had a well-regulated change with temperature decreased.

1.3 The source of ore forming fluid.

The isotopic data of H and O ($\delta$D: -68.9‰~ -109.6‰) show that the ore fluids consist of volcano water or the mixture of volcano water and rain water.

2 The Main Metallogenic Material Source

Guilaizhuang gold ore field has received tremendous international attention in the research of gold mineralization. Previous studies have got quite a few achievements in this area and, to some extent, the geological setting, the regional structure, the magmatism, the ore-forming fluids and the metallogenic mechanism of this deposit have been known. However, the source of ore-forming materials are often ambiguous and raise wide concerns. It is still a bottle neck limiting the development of the further research, due to the lacking of the direct
petrological or mineralogical evidence.

The ratios of the sulfur isotopes in pyrite are with a restricted compositional range of -0.71~+2.99. The characteristics of sulfur isotopic composition show that the gold substance forming the deposits in this area is derived from the mantle and deep crust and are related to Mesozoic magmatism. Lin, et al. (1997) have shown that the average gold content of the Tongshi complex (0.70~1.06×10⁻⁹, n=29) that in Precambrian rock formations (1.30×10⁻⁹, n=46) is significantly less than the average gold abundance of the crust whereas the gold content of the Taishan Group is three times greater than the average gold content of the crust. This indicates that the major metallogenetic matters may come from the lower crust or even from the upper mantle.

3 The Mineralogenetic Epoch

Detailed geochronological study shows the minerogenetic epoch belongs to early Yanshan orogeny (188~178 Ma), due to magma activity during late Yanshanian epoch.

4 The Ore-Forming Temperature, Pressure and Depth

The homogenization temperatures of ore forming fluid calculated range from 130°C to 330°C on the basis of the oxygen isotopic compositions of the calcite and quartz. The main metallogenetic temperature is from 130°C to 270°C, and the main metallogenetic pressure is under 0.036 GPa, corresponding to a depth of 1.08 km. Both the metallogenetic pressure and temperature are relatively lower, and the genetic classification of the ore deposit is epithermal deposit.

The intermediate-acidic magmatic crypto explosion generates the breccia (pipe), in which the crypto-explosion breccia type gold deposit emerged following the intrusion of the Tongshi complex.

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