1 Geological Setting

Mudanjiang intrusion-related quartz-vein gold deposit is located in Heilongjiang Province, with Bamiantong uplift (southwest of Jiamusi uplift) in the west; Mudanjiang deep fracture in the east; Mudanjiang uplift belt (Zhang Guang Cai Ling Aulacogen) in the north-east (Wang, 2005). Formations exposed here consist of Muleng, Houshigou, Hulin and successions of river and flood plain. Gold deposits are controlled mainly by faults, especially the north-east trending faults and north-south faults. Granites are distributed along the faults and gold-bearing veins develop in the hanging wall of diorite veins.

2 Ore Deposit Geological Characteristics

Mudanjiang intrusion-related quartz-vein gold deposit is composed of gold-bearing quartz veins which are mainly distributed in the hanging wall of diorite dikes. Mineralization is related to the hydrothermal fluids sourced from acidic and alkaline granite. Ore-bodies strike of 070°, 30° dip, and they are a few centimeters wide and extend for dozens of meters in alteration zones. The gold grade is 23.3 ppm in the vein, while in the west of the alteration zone is 13.3 ppm. Ore minerals appear as enchedral or granular, disseminated or banded. Gold mainly occurs in quartz veins, or veins of sericite appear golden yellow or pale yellow, with content of gold (72.28%) and silver (23.67%). Granule size is about 0.1–0.4 mm, and granules of 0.1 ~ 0.1mm are good for artificial heavy sample. In the past, gold grains of 1.5–2.5 mm are often seen, with rough surface and ferric oxide thin films.

3 Prospecting Indicators

Ore deposit geological, geophysical, geochemical and remote sensing characteristics are closely associated with gold mineralization and can be used as important indicators for gold prospecting.

3.1 Tectonic indicators

Together with the north-south, east-west structures, the north-east trending fractures play an important role in controlling mineralization, and breccias-pipes are direct ore-prospecting criteria.

3.2 Magmatic indicators

Yanshanian intrusions are distributed widely in this area. Mineralization usually develops at the contact of granodiorite and granite porphyry. Contact zones can be used as an exploration guide. Diorites dikes are closely related to mineralization and are a direct prospecting indicator.

3.3 Remote sensing indicators

ATM, BTM tonal anomaly zones and linear image zones are important prospecting indicators. Intersections of north-east linears with north-south, east-west linears are favorable for prospecting area.

3.4 Gravity anomaly indicators

Mudanjiang intrusion-related quartz-vein gold deposit is located between Qitaihe slope zone of Jiamushi uplift and Mudanjiang uplift belt of Zhangguangcailing Aulacogen. The Moho depth contour is about 37 km or so. Regional area occurs gravity negative anomaly of \(-20\times10^{-5}\text{m/s}^2\), while the uplift area should be positive (Zhang, 2004), but instead, target area appears as a negative anomaly, which
may indicates development of faults. Therefore target area is favorable for hydrothermal gold mineralization.

3.5 Soil geochemical indicators

Au, Cu, As, Sb, Hg elements are correlated and are not correlated with Ag, Pb, Zn, Co, Ni, Mo, W element (Anweiler and Campbell, 1982; Luo, 2009; Yang et al., 2010). These five elements (Au, Cu, As, Sb, Hg) and their combined anomalies can be used as prospecting indicators.

South of the area two abnormal Pb Zn anomalies occur. (1) Wulin Pb Zn anomaly of approximately 1 km² is developed in Neoproterozoic fine grained biotite-plagioclase granite, in proximity to many diorite- and quartz-veins. Within the anomaly abnormal gold mining activity suggests gold-bearing quartz-vein alteration zones may occur. (2) Yaolangbeishan scattered grade Pb Zn anomaly of about 1.5 km² is developed in mild migmatization biotite plagioclase granite and there are no veins.

3.6 IP anomaly indicators

The ore-body shows low resistance and high polarization rate; while the surrounding rock shows high resistance and low polarization rate, so high apparent chargeability values are an important prospecting indicator.

4 Conclusion

Geological setting and ore deposit geological characteristics are used to define prospecting indicators for the Mudanjiang intrusion related quartz-vein type gold deposit. These coincident indicators define targets for further prospecting.

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