The Tuanjiegou gold deposit is the largest epithermal gold deposit discovered in Heilongjiang province, northeastern China. It’s located in the eastern part of the Central Asian Orogenic Belt (CAOB), north of the boundary between the Jiamusi block and the Songnen block.

The strata developed in the Tuanjiegou area can be definitely divided into two units. The underlying unit is the Late Paleozoic Heilongjiang group, which consists mainly of amphibolites, chlorite schists, and mica-quartz schists, while the overlying unit include the Early Cretaceous Ningyuancun Group andesitic-rhyolitic volcanics and the Early Cretaceous Taoqihe Group sandstones and conglomerates (Wang et al. 2012). The plagiogranite porphyry intruded as stock into both the Heilongjiang group metamorphic rocks and the Ningyuancun Group volcanics, and is covered by the Taoqihe Group clastic rocks.

More than 80 ore bodies have been discovered in this district. Most of them are controlled by the NWW-trending faults within the plagiogranite porphyry or in the contact zone between the plagiogranite porphyry and the Heilongjiang group (Wang et al. 2004), which indicates that the metallogenesis of the Tuanjiegou gold deposit is genetically linked to the plagiogranite porphyry.

The ores occur as disseminations, veins or breccias. The ore minerals are predominantly native gold, pyrite, marcasite, chalcopyrite, galena, pyrrhotite, and orpiment, while quartz, sericite, ankerite and calcite are the most abundant the gangue minerals.

In this study, we collected two plagiogranite porphyry samples from the footwall (N48°22′20″, E130°16′12″) and the hanging wall (N48°22′15″, E130°16′4″) of the orebody respectively. The plagiogranite porphyry in the hanging wall has developed more intensive alteration than in the footwall. Based on the microscopic study of relatively fresh samples, the plagiogranite porphyry is mainly composed of plagioclase (~60 vol.%) with subordinate quartz (~25 vol.%) and orthoclase (~10 vol.%), accessory biotite, apatite, magnetite and epidote are also found in it. The phenocrysts are dominated by oligoclase and quartz, while the matrix is mainly composed of oligoclase, albite, quartz and accessory minerals.

Microscopic and cathodoluminescence (CL) images show that Zircons in the plagiogranite porphyry from both the hanging wall (TJG-2) and the footwall (TJG-1) have almost the same crystal form and size, most of the zircons are euhedral to subhedral and range from 80 to 250 µm in length.
size, with width to length ratios of 1:1.5-2.5. All the zircons show typical oscillatory zoning in the rims (Fig. 1), indicating their magmatic origin. The Th/U ratios of zircon grains in the hanging wall plagiogranite porphyry are 0.3-0.5, similar to zircons in the footwall plagiogranite porphyry (0.3-0.6).

Nineteen analyses of the zircons in the hanging wall plagiogranite porphyry (TJG-2) yield a weighted mean $^{206}\text{Pb}^{238}\text{U}$ age of 106.0±0.9Ma (n=19, MSWD = 1.6). While eighteen analyses of the zircons in the footwall plagiogranite porphyry (TJG-1) produce a weighted mean $^{206}\text{Pb}^{238}\text{U}$ age of 105.3±0.9Ma (n=18, MSWD = 1.2) (Fig. 2). These two comparative U-Pb ages represent the crystallization age of ore-bearing plagiogranite porphyry, also indicating the metallogenic age of the Tuanjiegou gold deposit to be 105.3-106.0Ma.

Key words: U-Pb geochronology, Tuanjiegou gold deposit, plagiogranite porphyry, Heilongjiang province

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