The Jiapigou gold belt (JGB) at the northeastern margin of the North China Craton, is one of the most important gold-producing districts in China. It is composed of 17 gold deposits, with a total reserve of >150 t Au. The deposits are hosted in Archean gneiss and TTG rocks, and are largely controlled by shear zones or fractures of varying orientations and magnitudes (Fig. 1). Timing of mineralization of this gold belt has long been debated. Some researchers claimed that gold deposits of the JGB formed in the Late Archean (Shen et al., 1994; Huang et al., 2012), others proposed that gold mineralization occurred in Triassic (Wei et al., 2002; Miao et al., 2005) or Yanshanian (Sun and Feng 1997; Huang et al., 2012).

Dikes are widespread in the JGB, mainly consisting of granodiorite, diorite, diorite porphyrite, syenite porphyry, granite porphyry, lamprophyre and diabase. The dikes range from a few meters to 1750 m in length and from several centimeters to 500 m in width (Sun and Feng, 1997; Zeng et al., 2014).

Three syenite porphyry samples were collected from the Erdaogou, Benqu and Bajiazi gold deposits in the JGB for a LA-ICP-MS geochronological study. U–Th–Pb analyses were done using the LA-ICP-MS at the State Key Laboratory of Lithospheric Evolution, Beijing. The results are graphically shown in the U-Pb concordia (Fig. 2). Zircon grains from the syenite porphyry...
Zircon grains from the syenite porphyry (BQ0835) in the Benqu deposit have U and Th contents of 5177–10807 and 1986–5774 ppm, with Th/U ratios of 0.38–0.59. Zircon grains from the syenite porphyry (BJZ280) in the Bajiazi deposit have U and Th contents of 217–9262 and 166–6762 ppm, with Th/U ratios of 0.50–0.76. These grains show oscillatory zoning, typical of magmatic zircon.

The analyses performed on the zircons from the three deposits yield concordant ages, they are 258 ± 2.8 Ma, 261 ± 3 Ma and 261 ± 5 Ma, respectively (Fig. 2). These analytical values are consistent within the errors. We interpret these ages to be the time of emplacement and crystallization of the syenite porphyry dykes in the JGB.

These syenite porphyry dykes are post-ore dykes which cut the orebodies in various deposits in the JGB. Therefore, the main stage of gold mineralization must predate the emplacement of these syenite porphyry dykes. Zircon U–Pb dating studies indicate that the gold mineralization in the JGB should be produced before at the 258–261 Ma.

The ages of the syenite porphyry dykes are consistent with the time of the collision between the Siberia Plate and the North China Plate ended in the late Permian (Xiao et al. 2003; Chen et al. 2009; Jian et al. 2010), therefore the Late Permian magmatism took place in a syn- or post-collision tectonic setting. Geological features indicate that the gold orebodies are controlled by the main and secondary brittle-ductile shear zones (Liu et al., 2003; Zeng et al., 2014). The main shear zone in JGB parallels the strike of the main faults caused by collision between the Siberia Plate and the North China Plate. The Shear zone and the gold mineralization were the products of the process of palaeo-Asian Ocean tectonic evolution in Late Palaeozoic (Permian).

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References


