

Metamorphic conditions of blueschists and greenschists in the Toudaoqiao area, in Inner Mongolia, NE China

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Blueschists and related metamorphic rocks are exposed in the Toudaoqiao area of the Honghuaerji-Yimin district in Inner Mongolia, northeastern China (Ye et al., 1994). These metamorphic rocks occur along Tayuan-Xiguitu fault, located between the Ergun block and the Xing'an block, and those are situated in the eastern parts of the Central Asian Orogenic Belt (Sengor et al., 1993).

Zhao et al. (2011) reported that blueschists occur together with greenschists, pelitic schists and siliceous schists in this area. The blueschist consists of amphibole (Gln, Mg-rbk and Win), epidote, albite, phengite (Si=6.7-7.0 p.f.u.), quartz, titanite and hematite, and the metamorphic conditions are in the epidote-glaucophane facies (380-450°C, 11-14kbar).

In this study we describe barroisite-bearing blueschists and greenschists. The barroisite-bearing blueschists consist mainly of amphibole (Mg-rbk, Gln, Win, Ktp and Brs), epidote, albite, phengite (Si=6.7-7.2 p.f.u.), chlorite, quartz, calcite and titanite with minor amounts of hematite. The amphibole is of subhedral prismatic crystal with size up to 0.2 mm long. It contains inclusions of amphibole (Ktp and Brs) as a relic of the precursor metamorphic event. The amphibole is zoned with winchite core ($Na_B=0.54-1.48$ p.f.u.) to magnesioriebeckite rim ($Na_B=1.52-1.81$ p.f.u.), and it is partly replaced by chlorite, calcite, titanite and quartz. The zoning texture suggests the prograde stage is in the winchite stability field followed by the magnesioriebeckite/glaucophane stability field. The peak metamorphic stage is characterized by the rim of amphibole (Mg-rbk/Gln) and coexisting minerals (epidote+albite ($An<0.38$)+phengite (Si=7.2 p.f.u.))+hematite+titanite+calcite), suggesting the epidote-glaucophane schist facies metamorphic event. The retrograde stage is represent of chlorite, calcite, quartz and titanite, which replace the amphibole, probably suggests the greenschist metamorphic event. The peak stage mineral assemblage is same as the previously described blueschist, and the metamorphic condition are T=390-450°C, P=13-15kbar.

The greenschists consist mainly of amphibole (Act, Mg-hbl, Ts, Ed and Hs), epidote, chlorite, albite, phengite (Si=6.7-6.9 p.f.u.), quartz, calcite and titanite with minor amounts of hematite. The amphibole is mainly classified as actinolite ($Na_B<0.34$ p.f.u.), and it is of euhedral to subhedral prismatic crystal, with size up to 0.5 mm long. It is commonly zoned with magnesiohornblende (Ti=0.14-0.26 p.f.u.) core and actinolite ($Na_B<0.16$ p.f.u.) rim, and its core contains inclusions of amphibole (Ts, Ed, Hs and Mg-hbl (Ti<0.10 p.f.u.)) and titanate. Actinolite ($Na_B=0.10-0.34$ p.f.u.) and chlorite occur along cleavages of the zoned amphibole. The core of the amphibole and its inclusions (Ts, Ed, Hs and Mg-hbl) as relic of the precursor high temperature metamorphic event. The peak metamorphism is represented by actinolite+chlorite+epidote+albite ($An<0.2$)+phengite (Si=6.9 p.f.u.)+quartz+hematite, suggesting low-temperature and high-pressure metamorphic condition.

Reference

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