

Spinel exsolved from clinopyroxene in the Haladala gabbro (western Tianshan, Xinjiang, China)

JING CHEN¹, LI CHEN¹, YONGFENG ZHU²

1 School of Physics, Peking University, Beijing 100871,
China

2 School of Earth and Space Science, Peking University,
Beijing 100871, China

The Haladala gabbro intruded into Carboniferous volcanic-sedimentary strata in western Tianshan (Xinjiang, China). Three kinds of rocks (olivine gabbro, troctolite, gabbro) were identified based on petrographic observations. Most samples have typical cumulate texture, in which olivine and plagioclase occur as cumulate phases, amphibole and phlogopite occur as post-cumulate phases. Orthopyroxene, clinopyroxene, and magnetite occur both as cumulate phases as well as post-cumulate phases. Spinel rods in clinopyroxene have been identified in troctolite and olivine gabbro. Topotactically oriented spinel rods and orthopyroxene lamellae exsolved from host clinopyroxene. The spinel rod (100) is coherently intergrowth with its host clinopyroxene (010). The high-resolution TEM images clearly show that there is a topotactic relationship between spinel and clinopyroxene lattices such that spinel rods (100) are parallel to their host clinopyroxene (010). Several selected area electron diffraction (SAED) patterns of the same microphase were obtained by tilting the sample in the double-tilt stage. The SAED pattern for a spinel rod is consistent with a face-centred cubic unit cell of cell edge $a \approx 8.5 \text{ \AA}$, implying a spinel-group mineral. The EDS line scan shows that the spinel rod is composed by Cr, Fe, Ti oxides mainly. Elements scanning measurements show that the Fe, Ti and Cr contents in the spinel rods increase in comparison with its host clinopyroxene, while Si and Mg contents decrease sharply. Geodynamic implications of this exsolution texture is discussed in this contribution.