

Mineral Inclusions in Chromite from the Al-Rich Type Chromite Deposit in the Kudi Ophiolitic Suite, Northwestern China

Jian Wang,* Jian G Liu, and Keiko H Hattori

College of Earth Sciences, Jilin University, Changchun, Jilin Province, China, *e-mail, wangjian304@jlu.edu.cn

The Kudi ophiolite suite occurs in the Oyttag-Kudi suture, which is the northernmost zone between Tarim Basin and Himalaya terrane. The suture zone formed from the south-dipping subduction of the Proto-Tethys plate during the early Paleozoic and hosts several chromitite bodies. Chromitite bodies are elongated, less than 2 m in width and more than 30 m in length, and are concordant with weakly serpentinized dunite lenses. One body, 0.3 to 1.5 m in width and more than 50 m in length, is sub-concordant with the weak foliation of overlying harzburgite.

Chromite in these chromitites contains a wide range of mineral inclusions, such as clinopyroxene, amphibole, phlogopite, olivine, orthopyroxene, apatite, base-metal sulfides, calcite, and brucite. The modal abundance of inclusions varies greatly among different grains of chromite. Among them, clinopyroxene and amphibole are common and form monomineralic inclusions or aggregates with other minerals. Some inclusions, such as olivine and clinopyroxene, form euhedral to subhedral crystals, suggesting that they were incorporated into chromite during its crystallization, but the majority of inclusions were probably trapped during sub-solidus recrystallization of chromite. Amphibole and phlogopite are anhedral and mostly form aggregates. They likely formed through reactions between crystals and melts/liquids. Sulfide inclusions are pentlandite, chalcopyrite, and cubanite. They occur either as isolated grains or together with silicate minerals. Using the chromite composition, parental magma is calculated to contain 15.0 to 16.5 wt % Al_2O_3 and 0.30 to 1.05 wt % TiO_2 . The estimated melt composition is comparable with that of MORB.

High-Fo olivine in disseminated chromitite and dunite of the Kudi ophiolite suggests a subduction environment. Considering that the parental magma is MORB-like and chromite contains abundant hydrous inclusions, we propose that Kudi chromitites likely formed in a fore-arc mantle during the initiation of subduction of Proto-Tethys. During this stage, tholeiitic melt formed by slab dehydration and interacted with harzburgite to form the Kudi high-Al chromitites.