Magmatic and metamorphic chromite in the Hongshishan mafic-ultramafic complex, NW China: insights from hosted solid inclusions and Fe-rich chromite

BANXIAO RUAN[1], YINGMIN YU[2], XINBIAO LV[3]

1 Institute of Geologic Survey, China University of Geosciences, Wuhan 430074, China, 514589797@qq.com
2 Nanjing University, Nanjing, 210023, China, yuym1992@126.com
3 Faculty of Earth Resources, China University of Geosciences, Wuhan 430074, China, 748555304@qq.com

The early Permian Hongshishan mafic-ultramafic complex is located in the western Beishan Terrane, NW China, and hosts an economic Ni-Cu deposit. Chromite as accessory mineral from the complex is divided into three types based on its occurrence and morphology. Euhedral type 1 chromite occurs as inclusions hosted in silicate minerals and is considered as primary and magmatic origin. According to its composition, the parental melt of the complex is characterized by high temperature, picritic affinity and hydrous nature. Besides, the post-orogenic extension in an intracontinental rift setting is responsible for the complexes in the Beishan Terrane.

Type 2 chromite occurs among serpentine, as interstitial phase. Type 2 and zoned type 3 chromite are more likely non-magmatic origin. They are of metamorphic or alteration origin involving multistage post-magmatic processes such as dissolution and precipitation, diffusion, retrograde or prograde metamorphism. The modified chromite host six types of inclusions according to mineral assemblages. The bulk composition of these inclusions is distinct with estimated parental magma. These inclusions are Not captured as melt inclusions. Multiphase inclusions, like Opx-Amp and Opx-Phl assemblages, were ascribed to the reactions of melts/fluids and anhydrous minerals in prograde metamorphism. The bright rim of zoned chromite is obviously formed by post-magmatic alteration.

Generally, three stages are proposed for the metamorphic history of chromite. First, the primary chromite undergone dissolution-precipitation in prograde metamorphism. Heterogeneous entrapment of silicate minerals and fluids produced multiphase solid inclusions. In later hydrothermal stage, ferrian chromite rich in Fe^{3+} form in an oxiding conditions. Finally, Cr-magnetite formed due to subsolidus equilibrium between ferrian chromite.