

Magma Mixing in the Huangshandong Ni-Cu Sulfide-Bearing Mafic-Ultramafic Complex, NW China

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Magma mixing occurs in some magmatic Ni-Cu-(PGE) sulfide deposits and is interpreted to play an important role in attainment of magma sulfide saturation, but the magma-mixing process remains unclear. In this study, we use petrology, mineral compositions, and LA-ICP-MS trace element mapping to better understand the magmatic mixing process in the Huangshandong sulfide-bearing mafic-ultramafic complex, eastern Tianshan, NW China.

A sulfide-bearing layer developed at the boundary between the bottom hornblende gabbro and upper pyroxenite in the Huangshandong Ni-Cu sulfide deposit. There are hornblende gabbro inclusions enclosed in the pyroxenite, and the contents of the xenocrystal plagioclases in the hybrid layer increase closer to the hornblende gabbro. The average An contents of plagioclases from hornblende gabbro (67.2%) are similar to those from the hybrid layer (67.6%), suggesting that the plagioclases of the hybrid layer come from the hornblende gabbro. The plagioclases in hornblende gabbro show a zonal structure in backscattering image, and their An contents range from 43.9 to 73.9. LA-ICP-MS trace element mapping data shows that An content of the plagioclases in the hornblende gabbro have a trend of first decrease and then increase from core to rim, suggesting a more mafic magma may have been added into the hornblende gabbro when the plagioclases crystallized. When replenishing pyroxene-rich crystal mush intruded at the top of the plagioclase-rich crystal mush residing in a chamber, the plagioclase crystals would rise into the pyroxene-rich crystal mush due to buoyancy, while the sulfide in the pyroxene-rich crystal mush would settle down and percolate into the bottom hornblende gabbro .