Multi-stage process of the Purang ophiolitic chromitites (SW Tibet): insights from magnesiochromite-hosted silicate mineral and other inclusions

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The textural and compositional characteristics of the silicate minerals found as inclusions in magnesiochromite grains from the mantle-hosted chromitites of the Purang ophiolitic (SW Tibet) were the main objectives of this study. Silicate mineral inclusions identified consist of orthopyroxene and clinopyroxene, ranging in size from a few μm to several hundreds of μm across. Some magnesiochromite grains have a few silicate mineral inclusions; others host tens of them, occurring solely as monophase crystals. Most of these inclusions are sub-rounded to globular or needle-like in shape, but some show cubic/octahedral crystal morphology. These cubic/octahedral inclusions appear as negative crystals mimicking the symmetry of their magnesiochromite host and were only observed in a multi-textured chromitite sample without needle-shaped inclusions. The globular and cubic

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silicate inclusions appear randomly distributed in the magnesiochromite grains, though occasionally groups of these inclusions appear to cluster within magnesiochromite cores. In contrast, the needle-shaped inclusions are fine-grained (≤3 μm thick, 10-50 μm long) and developed in different crystallographic orientations indicating that they were actually exsolved from the magnesiochromite host as topotaxially aligned lamellae. Our observations show that they were most likely recycled from the deep upper mantle (12.5 and 20 GPa at > 1400 °C). Except the silicate minerals in the chromian spinels, some special minerals are occurred in the chromitite, such as amphibole and wüstite. Trace element of the Purang chromitite calculations demonstrate that the parental melts of chromitites had similar with the boninite melt. The apparent polygenetic origin of the Purang chromitites necessitates a reassessment of the geodynamic history of the sub-oceanic lithospheric mantle of the western branch of Neo-Tethys. Based on the above-mentioned different types of inclusion studies, the chromitite formed by multi-stage of magma evolution process and melt.