

Melt inclusions in podiform chromitites hosted in the mantle section of the Oman ophiolite at Maqsad are used to estimate the composition of the melts from which they crystallised. The inclusions have now crystallised as a complex variety of mineral phases. Previous melt inclusion studies used high temperature melt homogenisation and showed that the trapped melts were basaltic in composition with MgO= 6.6-14.1 wt % [1, 2]. In this study we have analysed the surface area of the inclusions using an analytical scanning electron microscope, simulating a room-temperature homogenisation of the inclusion. Because the composition of individual inclusions is not representative we have taken the average of 260 inclusions from six chromitite samples. Our results show that the MgO content is much higher than previously supposed and varies from 23-27 wt % MgO with a mean value of 25.4 wt% MgO. We propose that the difference in result is due to the re-equilibration of melt with the chromite host during the high temperature homogenisation. We have carefully examined the rim areas of our melt inclusions and see no enrichment in the chromite host immediately surrounding the melt inclusions. In detail the melt inclusions are typically about 50-90 microns across and are made up of the hydrous phases pargasite, Na- and K-phlogopite, chlorite +/- grossular. In addition the following solid phases are reported as inclusions in the chromite – orthopyroxene, clinopyroxene, olivine and a chromite with a higher cr# than that of the host. In addition there are very small rounded areas of Ni-Fe-sulphides apparently immiscible in the silicate.

The measured melt compositions are similar to those reported from melt inclusions in chromite in boninites from the Ogasawara archipelago, Japan [3] and to melt compositions generated during the wet melting of depleted mantle harzburgite [4]. These results strongly support the view that podiform chromitites in the mantle section of the Oman ophiolite at Maqsad crystallised from melts which formed by the hydrous melting of depleted mantle harzburgite at very high temperatures. The most likely tectonic setting therefore for the generation of these chromitite bodies is in a subduction setting [5]. This result is at variance with the standard interpretation of the Oman ophiolite, not least because the chromitites have mid-ocean ridge basalt-like cr# with values in the range 0.49-0.58 [5]. Nevertheless our work further affirms recent research which suggest that podiform mantle chromitites do not form at an ocean ridge [5] and are an important petrological marker of subduction.

[1] Schiano et al., 1997, EPSL, 146, 489-497 [2] Borisova et al., 2012, J. Petrol., 53, 2411-2444 [3] Umino et al., 2015, Geology, 43, 151-154 [4] Falloon and Danyushevsky, 2000, J. Petrol., 41, 257-283 [5] Rollinson and Adetunji, 2013, Lithos, 177, 314-327