CHEMISTRY OF OPAQUE MINERALS FROM PERIDOTITE AND ECLOGITE XENOLITHS

J.B. Dawson[1] and J.V. Smith[2]

1) Dept. of Geology, University of St. Andrews, Fife, Scotland.
2) Dept. of Geophysical Sciences, University of Chicago, Illinois 60637, U.S.A.

Opaque phases in a variety of peridotite and eclogite xenoliths from South African kimberlites and in peridotites from the Lashaine volcano have been analysed with the electron microprobe. When plotted on a $MgCr_2O_4$ - $MgAl_2O_4$ - Fe_3O_4 diagram, chrome-rich spinels from eleven garnet lherzolites, spinel lherzolites and spinel harzburgites, together with eleven analyses from the literature, show a trend mainly from $MgCr_2O_4$ to $MgAl_2O_4$ with relatively little Fe_3O_4 in solid solution. There is a weak tendency for the chromium-righ spinels to occur in lherzolites, and some of the lherzolite specimens plot close to the magnesian chromite inclusions found in diamond. The whole suite overlaps the range found by IRVINE (1967) for chromites from ultramafic rocks. There is a good positive correlation between Cr/(Cr + Al) for co-existing spinels and pyroxenes. When rutile is a co-existing phase, Ti is also high in the spinel.

Picrochromites from a dunite and a glimmerite contain, respectively, MgO 6.7, Cr_2O_3 1.6 and MgO 11.0, Cr_2O_3 1.5 wt. %. In the dunite the ilmenites coexist with relatively iron-rich olivine (Fo_{85}) and is a new paragenesis, possibly analogous to the pyroxene-ilmenite and garnet-ilmenite intergrowths reported by BOYD and DAWSON (1972).

Rutiles from eclogites have low (0.0n wt. %) Cr_2O_3, whereas those from lherzolites and a glimmerite contain between 1.6 and 7.2 wt. %. One rutile grain in a spinel lherzolite from the Bultfontein Mine is zoned from a core with Cr_2O_3 7.2, FeO 0.6, MgO 0.1 to a rim of composition Cr_2O_3 7.0, FeO 2.3, MgO 8.9 wt. %; the rim contains minute needle-like lamellae of ?picrochromite.

References

BOYD, F.R. and DAWSON, J.B. Carnegie Inst. Washington Year Book 71, 373-378, 1972.

IRVINE, N. Can. Jour. Earth Sci. 4, 71-103, 1967.