

MINERAL CHEMISTRY AS AN INDICATOR OF CRYSTALLIZATION PATHS IN CARBONATE-BEARING MAGMAS

- W. I. Ridley (Lamont-Doherty Geological Observatory, Columbia University, Palisades, New York 10964)
D. Elthon (Department of Geological Sciences, Columbia University, Palisades, New York 10964)

There are several localities at which carbonatites are intimately associated with other carbonated rocks showing a range of carbonate/silicate ratios, e.g., kimberlites, alnoites, damkjærnites, mica lamprophyres, carbonated nepheline syenites, ijolites etc. Usually these associations are sufficiently intimate to suggest genetic relationships which may throw some light on the ultimate origin of both kimberlitic and carbonatitic magmas. Presently, little comprehensive data are available that document variations in crystal chemistry, stability limitations and reaction relationships in such rock associations. We are currently examining the detailed mineral chemistry of suites of samples from the Oka Complex, Monteregian Hills; Magnet Cove Complex, Arkansas; Beemerville Complex, New Jersey; and the Fen District of Norway. Initial studies have focussed on the nature of the spinel phases. The Oka carbonatites are unique in containing abundant magnetite showing a considerable solid solution of magnesioferrite, hercynite and jacobsonite. For instance, MnO is rarely < 2.5% and commonly 9-10%, MgO 1-9% and Al_2O_3 1-13%. These rocks also contain spinels which are hercynite-spinel (s.s) solutions but also contain ~ 3% MnO. Similar spinels occur in the Magnet Cove carbonatites but with negligible MnO contents; the magnetites are similar to the Oka type, but again are lower in MnO.

In contrast, the Beemerville carbonatite contains a magnetite-ulvöspinel solid solution phase with only minor MnO, Al_2O_3 , MgO. In all these localities there is clear evidence for perovskite rimming magnetite, as well as perovskite occurring as a separate, groundmass phase. Preliminary data indicates that the more silicate-rich rocks associated with the carbonatites have spinels with much more restricted compositions.