

Kimberlite Petrology

Barbara H. Scott Smith

*Scott-Smith Petrology Inc., 2555 Edgemont Boulevard, North Vancouver, B.C., Canada
V7R 2M9*

KIMBERLITE PETROLOGY

Barbara H. Scott Smith

Scott-Smith Petrology Inc., 2555 Edgemont Boulevard, North Vancouver, B.C., Canada
V7R 2M9

Petrology deals with the origin, occurrence, structure and history of rocks (as defined in the American Geological Institute Glossary of Geology, 1987). Petrology has an important role to play in modern diamond exploration programmes. These roles range from area selection to defining priorities and methodology during exploration, evaluation and mining. Exploration-related petrological investigations are based on genetic terminology and classification schemes. Genetic terminology, or the meaningful pigeon-holing of rocks, may seem somewhat of an academic pursuit but it is essential if the origin, relationships and economic potential of different rocks are to be understood.

Group 1 and 2 kimberlites and lamproites, the only known primary sources of economic quantities of diamond, have been shown to be distinct rock types. Lamproites and Group 2 kimberlites have yet to be found in Canada. Although the magmas forming these rocks only act as a transporting agent for diamond, the differences between these and other rock types have important implications. Other petrographically similar, but petrogenetically distinct, rock types (e.g. alnoites, minettes) are often encountered during diamond exploration. These rocks appear to be of low potential for carrying economic quantities of diamonds and it is important to distinguish these rocks.

Kimberlites, lamproites and related rock types are complex hybrid rocks. In practice the recognition of different rock types is based mainly on their contrasting petrographic mineral assemblages which, when required, can be augmented by mineral and whole rock compositions. The textural and mineralogical classification, as well as the near surface emplacement, of these rock types also have important practical applications to exploration. Working definitions and classifications have been developed and

meaningfully applied in exploration programmes during the last two decades. Correctly classifying and interpreting the geology of these rocks, however, is not a straightforward task.

Most aspects of the application of petrology in diamond exploration programmes have been published elsewhere (see selected references below).

REFERENCES

MITCHELL, R.H., 1995. The role of petrography and lithochemisry in exploration for diamondiferous rocks. *In* Journal of Geochemical Exploration. *Edited by* W.L. Griffin. Volume 53, p. 339-350.

SCOTT SMITH, B.H., 1995a. Petrology and diamonds. *Explor. Mining Geol.* **4, 2**, 127-140.

Other useful papers/books

FIELD M. and SCOTT SMITH B.H. 1998. Near surface emplacement of kimberlites: contrasting models and why. Long abstract *In* Proceedings of the Seventh International Kimberlite Conference, Cape Town, South Africa, 1998. (Paper in press in Proceedings Volume).

FIELD M. & SCOTT SMITH B.H. 1998. Textural and genetic classification schemes for kimberlites: a new perspective. Long abstract *In* Proceedings of the Seventh International Kimberlite Conference, Cape Town, South Africa, 1998, p. 214-216. Revised handout and poster will be available at the course. Manuscript in preparation.

HELMSTAEDT H.H., 1994. Natural diamond occurrences and tectonic setting of "primary" diamond deposits. Course notes for Cordilleran section of GAC Short Course 18 on kimberlites and diamond indicator minerals. Vancouver, p. 1-79.

MITCHELL, R.H., 1986. *Kimberlites: Mineralogy, geochemistry and petrology*. Plenum Publishing, New York. 442pp.

MITCHELL, R.H. 1995. *Kimberlites, orangeites and related rocks*. Plenum Press, New York. 410 pp.

MITCHELL R.H. 1997. *Kimberlites, Orangeites, Lamproites, Melilitites, and Minettes: A Petrographic Atlas*. Almaz Press Inc, 243 pp.

MITCHELL, R.H. and BERGMAN, S.C., 1991. *Petrology of lamproites*. Plenum Publishing, New York. 447pp.

SCOTT SMITH B.H. 1996. Kimberlites. In Mitchell, R.H. ed. *Undersaturated Alkaline Rocks: Mineralogy, Petrogenesis, and Economic Potential*, Mineralogical Association of Canada Short Course Volume **24**, Winnipeg, Manitoba. pp. 217-243.

SCOTT SMITH B.H. 1996. Lamproites. In Mitchell, R.H. ed. *Undersaturated Alkaline Rocks: Mineralogy, Petrogenesis, and Economic Potential*, Mineralogical Association of Canada Short Course Volume **24**, Winnipeg, Manitoba. pp. 259-270.