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Advances in Kimberlite Petrology

Progress in kimberlite petrology not only depends on the commitment to understanding the rocks, but also the nature and extent of the rocks that are available for study. Despite the recognition in the early 1980s that lamproites are a second primary source of economic diamonds, the majority of diamonds continue to be recovered from kimberlites. The significant advances made during the last decade or so have resulted, in part, from the discovery of contrasting types of potentially economic kimberlites across Canada. Petrology may seem to be an academic pursuit, but it has important applications to diamond exploration and mining. Economic kimberlite petrology is based on rock type recognition or definitions, further subdivisions based on mineralogical and textural classifications, all aspects of kimberlite geology as well as petrogenesis and considerations of diamond potential and diamond distribution. To this end a number of advances have occurred.

The definition of kimberlite has not only been much better constrained but also the unconventional style of the definition has been ratified by the IUGS. The recognition and understanding of the economic potential of the different rock types that are relevant to diamond exploration has been clarified by applying the principle of petrological clans and the concept of lamprophyre-facies as well as by detailed mineralogical studies. The mineralogical classification of kimberlites has been refined. A new perspective of the textural classification has been proposed which hopefully provides a sounder basis for improving the understanding of the near-surface emplacement, or volcanology, of kimberlite magmas.

Continued exploration and mining in southern Africa has shown that one type of pipe, the so-called "classic" carrot-shaped kimberlite pipe, does predominate in this area. It has been confirmed that the diatreme zone can reach 1km in vertical extent, a feature previously proposed based only on a composite pipe model. Studies of the Orapa pipe in Botswana have revealed, for the first time, the detailed nature of the overlying craters and two probable end-member kinds of crater infill. Pipes similar to the "classic" southern African examples do occur in Canada confirming that it is a world-wide emplacement process. In South Africa there are some exceptions to this "rule". In contrast, in Canada, most of the pipes contrast with the "classic" southern Africa kimberlite pipe. There are at least two more probable end members (Canadian Prairies and Lac de Gras).

The two new "end member" kimberlite pipes have required the development of different near surface emplacement models. The contrasting emplacement models show that pipe formation processes are constrained by the near surface country rock geology into which the magmas are being emplaced. Different styles of eruption and diverse pipe infills also reflect the variable nature of the erupting magmas. In addition, some aspects of the volcanological processes appear to be unique to kimberlites and probably result from the high volatile contents of these unusual magmas.

DIAMOND SHORT COURSE

Monday January 21st, 2002
The Fairmont Hotel Vancouver
Saturna Island Room

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BRITISH COLUMBIA & YUKON CHAMBER OF
MINES

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DIAMOND SHORT COURSE
Monday January 21st, 2002
The Fairmont Hotel Vancouver, Saturna Room

Session Chairs:
Randy Turner – Diamondex Resources Ltd.
Brooke Clements – Ashton Mining of Canada Inc.

- 07:00 Pre-registration pickup & Registration – Lobby, The Fairmont Hotel Vancouver
- 08:00 **Randy Turner** – Diamondex Resources Ltd.
Introduction
- 08:10 **Barbara Scott-Smith Ph.D** – Scott-Smith Petrology Inc.
Advances in Kimberlite Petrology
- 08:45 **Tom McCandless Ph. D** - Ashton Mining of Canada Inc.
Morphology and Surface Features of Mantle – Derived Indicator Minerals
- 09:20 **Herman Grutter Ph.D** – Mineral Services Canada
Regional mapping of the Slave Craton mantle root.
- 09:55 Coffee
- 10:25 **Maya Kopylova Ph.D** – UBC – Department of Earth and Ocean Sciences
The deep structures of the Slave Craton
- 11:00 **Buddy Doyle-Kennecott Canada Inc.**
Geothermobarometer from the Slave and their implication for exploration and Kimberlite
Emplacement
- 11:35 **John Armstrong Ph.D** – Diamond Geologist DIAND NWT Region
Diamond Discovery in the Slave Craton: Compilations of exploration data as tools for future
discovery
- 12:10 Lunch – catch and kill your own
- 13:30 **David Butler Ph.D** – Whytecliff Geophysics Ltd.
Ground Penetrating Radar – An effective tool for kimberlite exploration
- 14:05 **Alan Jones Ph.D** – GSC
Illuminating Kimberlites: Kimberlite detection, delineation and area selection from electromagnetic
studies
- 14:30 **Doug McConnell P. Eng.- Fugro Airborne Surveys**
Airborne Geophysics for Kimberlite
- 14:50 **Malcom Thurston Ph.D** – MRDI USA
Microdiamonds for grade prediction
- 15:25 **Margot Whittall & Alan Carter Ph. D** – BHP Billiton
The Falcon System and Applications for Diamond Exploration
- 16:00 **Beer and Bull Session** – Sponsored by Diamondex Resources Ltd.
Delegates are invited to stay for an informal gathering after the Short Course
- 17:00 End