CLINOPYROXENE MEGACRYSTS FROM THE KALKPUT KIMBERLITE : A GROUP 2 KIMBERLITE FROM THE PRIESKA GROUP OF KIMBERLITES.

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The Kalkput kimberlite is one of 130 known kimberlites occurring along the south-western border of the Kaapvaal craton (Skinner et al. 1993). It occurs with a number of other group 2 kimberlites in a tectonic area bounded by the Doornberg and Brakbos faults. Although these kimberlites were found to be essentialy group 2 kimberlites, Skinner et al. (1993) found that a number display petrographic features normally associated with Group 1 kimberlites and/or olivine lamproites.

The presence of megacrysts in Group 2 kimberlites has only recently been described (Daniels and Gurney 1989). It was previously thought that megacrysts were exclusively confined to Group 1 kimberlites. Garnet megacrysts have since been described from a number of Group 2 kimberlite localities eg. Loxton, Southern Fissures, Excelsior, Monteleo and Phoenix Blow (Moore and Gurney, 1991), Lace (C.B. Smith pers. com.) while single examples of clinopyroxene megacrysts have been studied from Lace (C.B. Smith pers. com.). The abundance of clinopyroxene megacrysts at Kalkput is currently unique in a Group 2 kimberlite.

Megacrysts of clinopyroxene and macrocrysts of clinopyroxene, ilmenite and garnet were collected and analysed from Kalkput in this study. The presence of garnet megacrysts reported by Skinner (1989) at this locality could not be confirmed despite the analysis of in excess of 100 garnet xenocrysts.

The clinopyroxene megacrysts at Kalkput show an unusually large compositional range in 100Mg/(Mg+Fe) (Mg#) from 90 to 60. Two subgroups can be distinguished namely subcalcic diopside (SCD) and augite groups. The SCD shows linear decreasing Mg# and Cr_2O_3 (Figures 1 and 2) and increasing TiO_2 and Na_2O with increasing 100Ca/(Ca+Mg) (Ca#) similar to megacryst suites from other localities. TiO_2 increases continuously with Ca# which would indicate that ilmenite was not a significant crystallising phase with the SCD. A compositional gap exists between the SCD and the augite subgroups between Ca# 46.5 and 49.5. The augites do not contain detectable Cr_2O_3 and generally form an extension to the SCD trend with lower Mg# and higher TiO_2 and Na_2O.

Limited data for clinopyroxene megacrysts from Lace (C.B. Smith pers. com.) shows an overlap with the compositional spread from Kalkput which indicates that the trend observed at Kalkput could be a general feature of Group 2 kimberlites. The large compositional spread in terms of Mg# found at Kalkput is unrivalled amongst clinopyroxene megacrysts from Group 1 kimberlites. The only known locality where clinopyroxene megacrysts show a similarly large compositional spread is from the alnoite in Malaita. Figures 1 and 2 show comparisons between the compositional variations of clinopyroxene megacrysts at Monastery (Jakob 1977), Malaita (Nixon and Boyd 1979; Delany et al. 1979) and Kalkput. Relative to Malaita the Kalkput trend is displaced to higher Ca# at equivalent Mg# and Cr_2O_3.

This study shows that clinopyroxene megacrysts from a Group 2 kimberlite display systematic compositional variations that imply its formation by igneous fractionation processes. The broad similarity between clinopyroxene megacryst compositional trends from Group 1, Group 2 and alkali

basalts could be an indication that similar igneous processes have operated during or preceding the formation and emplacement of these magmas.

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FIGURE 1 : Ca# vs Mg# for clinopyroxene megacrysts from Kalkput. The compositional spread for clinopyroxene megacrysts from Monastery (solid line) (data from Jakob 1977) and Malaita (broken line) (data from Nixon and Boyd 1979; Delany et al. 1979) are shown.

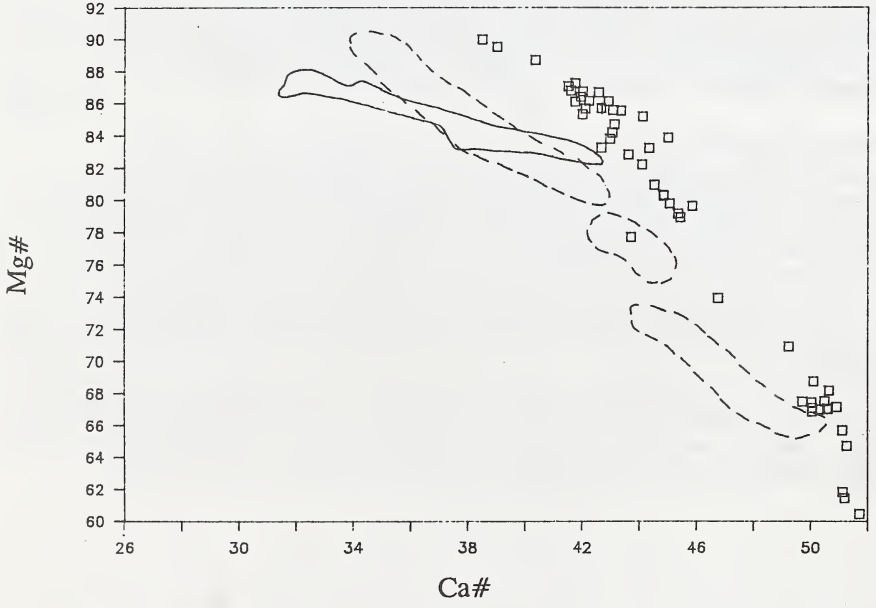

FIGURE 2 : Ca# vs Cr_2O_3 for clinopyroxene megacrysts from Kalkput. The compositional spread for clinopyroxene megacrysts from Monastery (solid line) (data from Jakob 1977) and Malaita (broken line) (data from Nixon and Boyd 1979; Delany et al. 1979) are shown.