# New diamond-bearing xenoliths from the Orapa Mine, Botswana

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This contribution deals with diamond-bearing rock fragments recovered recently during audit procedures on mine concentrates from the Orapa kimberlite. A total of 149 fragments were obtained for study. These consist of kimberlite (92 examples), eclogites (54 specimens) and peridotites (3 fragments). The specimens range from 2 to 40 mm in size and weigh approximately 0.02 to 40 gram. Typically only one diamond is exposed on the surface of the fragments with larger numbers (up to four) being contained in the mantle-derived xenoliths. Eclogites are usually bimineralic although a number of specimens comprise only of garnet or clinopyroxene. The three peridotitic fragments consist of orthopyroxene (1 specimen) or of olivine with orthopyroxene (2 specimens). Diamond shapes range from the rounded dodecahedral form in the kimberlite fragments to sharp-edged octahedra in the case of the mantle-derived xenoliths. Many of the diamonds in the xenoliths are partially graphite-coated.

Minerals were analysed for major and minor elements using a CAMECA SX50 electron microprobe at the Anglo American Research Laboratories. The garnets in the eclogite xenoliths analysed in this study are variable in composition and range from magnesian varieties to iron-rich and/or calcium-rich types (Figure 1). Elevated contents of $Na_2O$ in garnet and $K_2O$ in clinopyroxene are observed for most of the xenoliths (Figure 2), corresponding to the Group 1 eclogite chemistries as defined by McCandless and Gurney (1989). Equilibration temperatures calculated from garnet-clinopyroxene pairs utilising the thermometer of Ellis and Green (1979) range from ~$980^0$C to ~$1425^0$C (Figure 3). The mineral chemistry and conditions of equilibration of the Orapa eclogite xenoliths analysed in this study are broadly similar to that of Orapa eclogites described in previous investigations of diamond-bearing xenoliths from this mine (Robinson et al., 1984; Deines et al., 1991).

Orthopyroxenes and olivines in the peridotite xenoliths are magnesian with compositions of $Fo_{92\text{-}93}$ and $En_{93.36\text{-}93.93}$.

**References**

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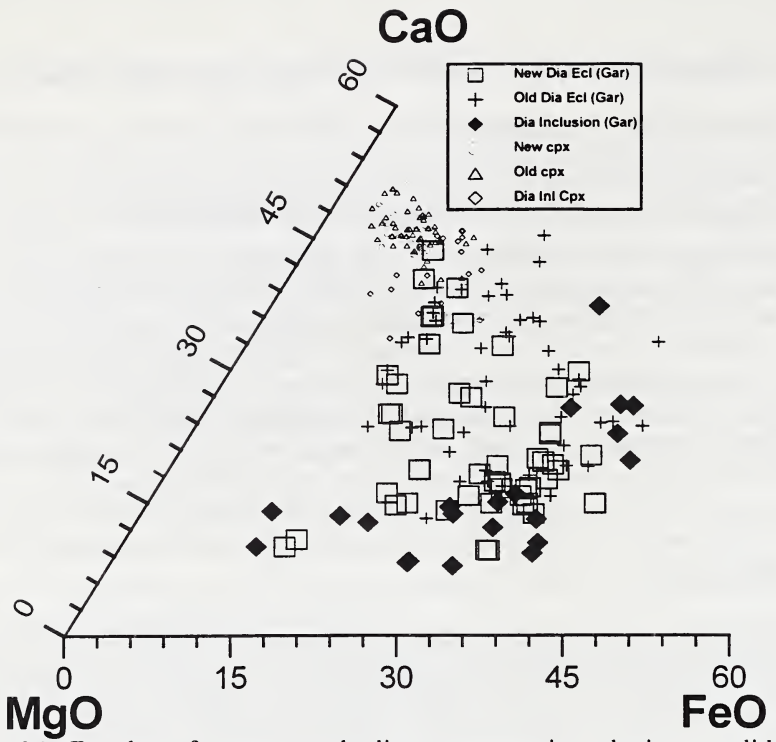


**Figure 1**: Ca-Mg-Fe plot of garnets and clinopyroxenes in eclogite xenoliths and eclogitic diamonds from the Orapa mine. Data from this study as well as Robinson et al. (1984) and Deines et al. (1991).

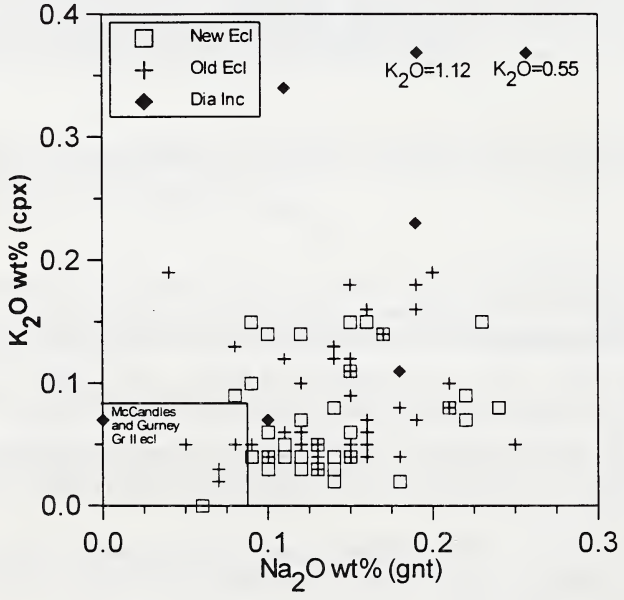


**Figure 2**: Plot of $Na_2O$ in garnet vs $K_2O$ in clinopyroxene for eclogite xenoliths as well as eclogitic inclusions in diamond from the Orapa mine.

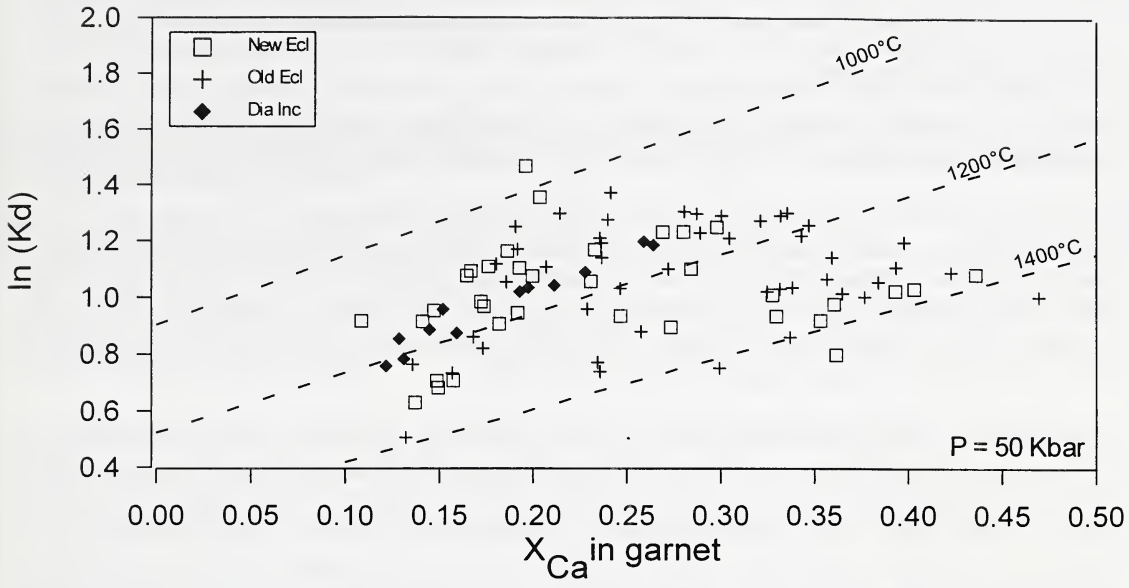


**Figure 3**: Plot of $X_{Ca}$ in garnet versus $\ln(K_D)$ for garnet-clinopyroxene pairs in eclogite xenoliths and eclogitic diamond from the Orapa mine.