# GEOCHEMICAL CORRELATIONS BETWEEN KIMBERLITIC INDICATOR MINERALS AND DIAMONDS AS APPLIED TO EXPLORATION

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Diamond Potential Based on the assumption that diamonds in kimberlite are derived from disaggregated xenoliths of peridotite and eclogite, the presence of diamond can frequently be successfully predicted by identifying the presence of the appropriate xenocrysts of two other resistant minerals, garnet and chromite. Since these are frequently sought in exploration programmes, such a predictive capability can be very useful in assigning priorities to prospective targets.

Both peridotitic and eclogitic diamonds are present in every well characterised kimberlite world-wide and in lamproites. Peridotitic diamonds predominate overall, but either paragenesis may dominate the diamond population at individual localities.

Peridotitic Diamonds The dominant source rocks of peridotitic diamonds are predicted to be harzburgites (probably carbonated) $\pm$ garnet and/or chromite. Lesser amounts of diamond are derived from garnet lherzolite. Garnet and chromite macrocrysts liberated from diamond harzburgite are in general more abundant than diamond itself and can be used as pathfinders to predict the presence of diamond. The garnets and chromites can be recognised by their compositions which are similar to some inclusions in diamonds.

Garnet and chromite macrocrysts from diamondiferous lherzolite cannot be similarly identified, and at present they are not useful in determining the economic potential of a kimberlite occurrence.

Eclogitic Diamonds Chrome-poor garnet macrocrysts liberated from potentially diamond-bearing eclogite (Group I eclogite) can also be identified on the basis of distinctive compositions. In some kimberlites, Group I eclogite has made a major contribution to the overall diamond content of the pipe.

Megacryst Minerals Many kimberlites contain megacryst suite minerals including abundant garnet similar in appearance to some eclogitic garnets, with which they may have overlapping major element compositions. Care must be taken to discriminate against these megacrysts since they are not related to diamond. Since megacryst garnets as a group show strong igneous trends they can be differentiated from eclogitic garnets on the basis of simple linear plots.

Preservation of Diamonds Resorption of diamonds after formation is an important process in southern Africa and some other diamond provinces. It is much less significant in the best known Siberian diamond populations and in places such as Angola. In southern Africa, highly oxidised ilmenite compositions with elevated inferred $Fe_2O_3$ contents are not associated with high grade kimberlites. This is inferred to be correlated with the resorption process that has affected the diamonds.

Application Based on a sound database, indicator mineral compositions can be used to predict the diamond content of kimberlites in a semi-quantitative way with considerable success, providing diamond content is regarded as the sum of harzburgitic diamonds plus eclogitic diamonds modified by resorption.

Exceptions Exceptions can occur. These can often be detected by additional investigations that better define the petrogenetic history of the indicator minerals and their source rocks.