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Statistical approaches to the discrimination of crust- and mantle-derived low-Cr garnet – major-element-based methods and their application in diamond exploration

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Abstract

In diamond exploration, the accurate distinction between garnets from the crust or mantle, or from those having a cognate origin with kimberlite (low-Cr megacrysts), is important for the assessment of indicator mineral samples; misclassifications potentially result in costly misdirection of exploration efforts. Existing literature databases and graphical classification schemes for garnets suffer from a paucity of craton-derived, lower-crustal garnets that – as shown here – are among the most difficult to distinguish from garnets of mantle origin. To improve this situation, a large database of new and literature garnet major element analyses has been compiled. Using this dataset, it is shown that the conventionally used Mg# ($Mg/(Mg+Fe)$) vs. Ca# ($Ca/(Mg+Ca)$) plot (Schulze, 2003) for discrimination of crust and mantle garnets results

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