Unit cell parameter as a proxy for composition of kimberlitic and non-kimberlitic chromite

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Chromite-rich spinel composition typically is used as a vector for diamond exploration; kimberlitic chromite occurring as inclusions in diamond has high Cr and very low Ti, whereas non-kimberlitic chromite typically shows lower Cr content and higher Ti. The primary focus of this study is to correlate chemical composition with unit cell parameter of chromite-rich spinel, $(Fe,Mg)[Cr, Al]_2O_4$, using *in situ* micro X-ray Diffraction (μXRD). Spinel group minerals are cubic, having one unit cell parameter, a_o. *In situ* μXRD makes it possible to correlate the composition with the unit cell parameter for individual grains. Our study is developing the unit cell parameter as a proxy for Electron Probe Microanalysis (EPMA). We have shown that a_o can be used as a stand-alone discrimination tool for kimberlitic versus non-kimberlitic chromite. Non-kimberlitic chromite yields unit cell parameter a_o < 8.29 Å. The unit cell parameter can also clearly discriminate chromite in the diamond inclusion field, which has values ranging from a_o = 8.29-8.33 Å. In addition, the xenocryst and phenocryst trends can be discriminated within the data.