

Ca isotope compositions of Prairie Lake carbonatite complex

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Calcium stable isotopes may provide insights into the nature of source and magmatic processes for carbonatites. $\delta^{44/42}\text{Ca}$ values of global carbonatites are reported in a large variation¹, but factors controlling the isotopic variation remain poorly known. Here we present a detailed Ca isotope study on an individual carbonatite complex, the Mesoproterozoic Prairie Lake carbonatite complex. Prairie Lake carbonatite complex is a well-preserved, typical “Nephelinite-clan carbonatite”, which is composed mainly of ijolites and carbonatites, with Ca minerals dominated by calcite, clinoproxene, apatite and garnet. Detailed Sr-Nd-Hf isotope studies show that the silicate and carbonatite rocks are co-genetic, derived from a weakly depleted mantle, with limited crustal contamination². Ca isotope measurements on 38 carbonatite and ijolite samples are analyzed for their whole-rock and carbonate-phase Ca isotopes. Whole-rock and carbonate phase of carbonatites have limited $\delta^{44/42}\text{Ca}$ variation between 0.31‰ to 0.35‰. Whole-rock ijolites have moderate $\delta^{44/42}\text{Ca}$ variation between 0.31‰ to 0.42‰ and the isotopic variation is well correlated with TiO₂ and Zr contents. Two whole-rock nepheline syenites have $\delta^{44/42}\text{Ca}$ values of 0.34‰ and 0.36‰. One pyroxenite have $\delta^{44/42}\text{Ca}$ values of 0.33‰. The factors controlling the isotopic variation in ijolites and the implications of these data will be discussed.

References:

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[2] Wu, F.-Y., Mitchell, R.H., Li, Q.-L., et al., 2017. Emplacement age and isotopic composition of the Prairie Lake carbonatite complex, Northwestern Ontario, Canada. *Geol. Mag.* 154, 217–236.