Selenium isotope variations in orogenic garnet pyroxenites

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Ultra-high pressure garnet pyroxenites from Ronda (S. Spain) and Beni Bousera (N. Morocco) orogenic massifs display strong geochemical evidence supporting that these mantle rocks derive from recycled oceanic and continental crust [1]. As such, these garnet pyroxenites provide a unique opportunity to trace the recycling of surface material — exposed to redox processes— into the mantle using the isotope variations of a redox-sensitive element such as selenium (Se).

Se isotopes have been widely used as sensitive tracers of low-temperature redox process on the Earth's surface [2], and more recently, as tracers for the origin and evolution of volatiles in the Earth's mantle [3-5]. Here, we report the first high-precision analyses of Se stable isotopes on garnet pyroxenites via double spike MC-ICP-MS [6-7]. These new data show that Se isotopes of garnet pyroxenites vary significantly beyond the mantle value [3], presumably reflecting their recycling-related origin. The results of this study enable us to: (1) expand the limited dataset of Se isotopes in mantle-derived rocks, (2) understand the processes involved in the origin of mantle heterogeneities and their potential contribution to basalt petrogenesis, and (3) provide valuable insights into the Earth's surface volatile evolution from the mantle perspective.

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