# Copper isotope fractionation during partial melting and melt percolation in the mantle

JIAN HUANG[1], FANG HUANG[1], ZAI-CONG, WANG[2], XING-CHAO ZHANG[1], SHA CHEN[1], HUI-MIN YU[1]

[1] School of Earth and Space Sciences, University of Science and Technology of China, Hefei 230026, China (jianhuang@ustc.edu.cn)

[2] Freie Universität Berlin, Institut für Geologische Wissenschaften, Malteserstrasse 74-100, 12249 Berlin, Germany

Copper is a transitional, chalcophile, redox-sensitive element with two stable isotopes ($^{63}$Cu and $^{65}$Cu). Copper isotopes have a potential to improve our knowledge of mantle dynamics[1, 2]. However, whether Cu isotope fractionation take places during partial melting and melt percolation in the mantle is not clearly constrained. Knowledge of this issue is important for applying Cu isotopes to high temperature igneous systems and to study mantle processes.

Here we report high-precision Cu isotope data for well-characterized peridotites of variable fertility from the Balmuccia nd Baldissero bodies in the Ivrea-Verbano Zone (Northern Italy)[3]. The samples have a history of melt depletion with subsequent melt infiltration.

$\delta^{65}Cu_{NIST\ 976}$ of the lherzolites and harzburgites ranges from -0.31 to 0.62‰, nagetively correlates with $Al_2O_3$, Cu, S, Se, and Te, and posstively with MgO. This suggests that partial melting and melt infiltration of the mantle can cause detectable Cu isotope variations. Dunites, formed by focused sulfur-undersaturated melt percolation with preferential dissolution of interstitial sulfdies, display heavy isotopic compositions with $\delta^{65}$Cu from 0.55 to 0.61‰. This suggests that Cu isotope fractationaton during melt percolation is controlled by dissolution of interstitial sulfides with lighter Cu isotopic compositions relative to coexisting silicate phases.

Our results show that magmatic fractionation and melt-peridotite intereaction in the mantle may play an important role in Cu isotope fractionation in mantle rocks.

[1] Liu et al. (2015, EPSL, 427: 95-103); [2] Savage et al. (2015, GPL, 1: 53-64); [3] Wang et al. (2013, GCA, 108: 21-44).