# Cu isotope signature of granites

WEIQIANG LI, SIMON E. JACKSON,
BRUCE W. CHAPPELL, OLIVIER ALARD AND
NORMAN J. PEARSON

GEMOC ARC National Key Centre, Department of Earth and Planetary Sciences, Macquarie University, NSW 2109, Australia (wli@els.mq.edu.au)

The Cu isotope signature of bulk earth is proposed to be homogeneous ($\delta^{65}Cu \approx 0$) based on measurements of sulphides from mafic intrusions (e.g. Larson *et al*., 2003) and a limited numbers of mantle-drived rocks (e.g. Archer and Vance, 2004). However, it has been reported that highly evolved granite can have a Fe isotope signature remarkably different (about 0.5‰ $\delta^{57}Fe$) from bulk earth values (Poitrasson and Freydier, 2005). As Cu is a trace element in most common rocks, and is also multivalent, its isotopes are more likely to be fractionated by Rayleigh (magma evolution) and redox (weathering / sedimentation) processes than Fe isotopes. Here we report our preliminary work to determine baseline values of $\delta^{65}Cu$ for various granite rocks and examine the Cu isotope homogeneity of crust.

A chemical procedure, modified from Maréchal (1999), was used to separate Cu from rock matrix. Quantitative recovery (100.9±1.2%) with a low total procedural background (2.65±0.66ng) for Cu has been achieved, allowing Cu isotopic measurements on samples with as little as 10 ppm Cu. Elution curves for peridotite, basalt and granodiorite indicate that elution of Cu is not affected by the bulk composition of rocks. Cu isotope ratios were measured with a Nu Plasma MC-ICP-MS using solution nebulisation sample introduction. Mass bias was corrected by both the sample-standard bracketing and the Ni-doping methods. The long-term external reproducibility of the measurements was 0.09‰ (2 sigma).

S-type and I-type granites from southeastern Australia have been analysed. The S-type granites have a large range of $\delta^{65}Cu$, varying from -0.40‰ to 0.37‰, while the $\delta^{65}Cu$ values of I type granites are less variable (from -0.05‰ to 0.26‰), generally overlaping each other within error around zero (the bulk earth value). However, samples of the mafic end member ($SiO_2$<55wt%) of an I-type granite suite show remarkable heavy Cu isotope signatures ($\delta^{65}Cu$ up to 1.56‰).

The distinguishable variation in Cu isotopic composition of the S-type granite may reflect isotopic heterogeneity in the sedimentary source region as a result of redox processes. However, the possibility of Cu isotope fractionation during magmatic and magmatic-hydrothermal processes cannot be ruled out.

## References

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