The Chromium isotope signature of granites

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An initial survey of selected granites from the British Isles and granite rock reference materials CRPG GS-N and USGS G2, show a wide range of chromium isotope values relative to NIST SRM 979 chromium isotope standard. The δ^{53}Cr values extend from -0.36‰ ±0.01 (2 s.e.) for the Cairnsmoor of Fleet pluton, southern Scotland to +0.04‰ ±0.04 (2 s.e.) for G2 from Rhode Island. By comparison mafic igneous rocks show very little variation, averaging about -0.16‰ [1]. The initital sample suite of 20 granites comprise both S and I-type granites from a variety of tectonic settings; extensional, subduction related, syn- and post-collisional.

Measurements were made on a Thermo-Finnigan Triton using Thermal Ionisation mass spectrometry. Reference materials GS-N and GSJ basalt JB1-A were regularly tested for comparison with published data. Our values of -0.19‰ ±0.02 (2 s.e.) for granite GS-N agrees well with the reported value of δ^{53}Cr -0.18‰ of Schoenberg et al. 2016.

The reasons for these measurable variations in granitic rocks are as yet unclear. Possiblilties under consideration are heterogeneity in the sedimentary protolith for S-type granites, isotopic fractionation during partial melting, hydrothermal overprinting, and diffusion gradients of hydrothermal fluids.

It is noted that other transition elements e.g. copper [2], iron and zinc [3] also exhibit stable isotopic variations in felsic rocks.

[1] Schoenberg et al., (2016) GCA, 183, 14–30.
[2] Li et al., (2009) Chemical Geology, 258, 38–49.
[3] Telus et al., (2012) GCA, 97, 247–265.