

The effect of AFC processes and source oxidation on Fe isotopes in evolved Banda Arc lavas

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Igneous rocks, ranging in composition from mafic to felsic, show resolvable variations in their stable Fe isotope compositions [1]. These variations are closely related to the oxidation state of Fe in igneous systems, i.e., Fe²⁺ and Fe³⁺, with heavy Fe isotope compositions predominately associated with the more oxidized species. Reported Fe isotope variations ($\delta^{57}\text{Fe}$ relative to IRMM-014) in island arc basalts (IAB) span a range from negative to positive values [2], and are on average systematically lighter than those reported for mid ocean ridge basalts (MORB) [3], a fact that is seemingly opposing their expected oxidation state.

Here we present the stable Fe isotope composition of 13 IAB and 8 subducting sediments sampled along the active Banda Arc (East Indonesia). All samples are well characterised for their Sr-Nd-Pb-Hf-O isotope composition, which record progressive sediment melt contribution along the arc from NE to SW. We find that crystal fractionation increases $\delta^{57}\text{Fe}$ and identify this process as the dominant factor controlling the Fe isotope composition of this evolved arc suite. The opposite effect is observed upon magnetite saturation at ~4 wt.% MgO. Arc crust assimilation has also a strong influence driving the IAB towards heavier Fe isotopes. Sediment melting appears to have little or no effect on the Fe isotope composition in contrast to signatures for most radiogenic isotope tracers.

We imply that Fe in the sediment melt fully equilibrates with the mantle wedge either prior to or during wedge melting. As a consequence, if it is assumed that sediment melts carry more Fe than aqueous fluids, the slab agent has little or no effect on the redox state of IAB sources. Instead we propose that progressive wedge depletion has the potential to harvest Fe³⁺ and this lowers $f\text{O}_2$ (and $\delta^{57}\text{Fe}$). If $\delta^{57}\text{Fe}$ monitors the redox conditions of evolving arc rocks, then crystal fractionation is the driving force in elevating $f\text{O}_2$ in subduction zones.

[1] Dauphas and Rouxel, *Mass Spectrometry Reviews*, 2006;

[2] Dauphas *et al.*, *EPSL*, 2009, [3] Teng *et al.*, *GCA* 2013

Geochemical features of granitoid Central Siberia magmatism in the Permian-Triassic

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The granitoids of the Kolyvan-Tomsk folded zone, part of the western segment of the Altai-Sayan region, are the youngest magmatic formations of Late Hercynian tectogenesis. Developing the geochemical criteria of granitoid classification is an important perspective for geodynamic interpretation of the granitoids. The studied rocks are characterized peraluminiferous and have converged features granite S-and I-types. I-granites have a more mafic composition with a high content of calcium amphibole and accessors in the form of magnetite and allanite. They are characterized by a high oxidation of iron and oxygen fugacity, appreciable concentrations of Ba (~ 800-1200 g / t), Sr (~ 1200-2000), and calcium. Derived from the granite-granodiorite -granosyenite series, geochemically similar to rocks of I-type. They can be attributed to the products of latite-type magmatism with $\text{K}_2\text{O} > \text{Na}_2\text{O}$, high the K/ Rb ratios, Mg, high Ni concentrations. Breed from leucogranit series are rather consistent with S-type characteristics. They have a relatively high concentration of Rb in the background of a sharp decrease in the content Ba (up to ~ 120 g / t) and Sr (up to ~ 40 g / t) are enriched in Be and Cs, which makes them similar to Li-F granites. The results of luminescent analysis of the granitoids studied (intensive X-ray luminescence of Fe³⁺ in feldspars) indicates also that they were formed from a high-alkaline melt. The geochemical differences (characteristics) discovered for the granitoids allow us to assume that they were formed under complicated geodynamic conditions from the high alkalinity melt. This study was funded by the Russian Ministry of Education and Science (projects 5.3143.2011, 14.B37.21.0686, 14.B37.21.1257).