Sulfur isotopes in sulfides from Lesser Antilles arc cumulates

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The sulfur isotope composition of igneous rocks in magmatic arcs can be difficult to constrain due to fractionation during degassing. Cumulate xenoliths from the lower arc crust are representative of the least degassed portion of the magmatic system. The Lesser Antilles arc presents a unique opportunity to investigate how increasing terrigenous sediment subducted from north (2 %) to south (15 %) influences arc magma chemistry. Here we present sulfur isotope compositions for primary magmatic sulfides and secondary interstitial sulfides in mafic cumulates from ten islands across the Lesser Antillles arc.

Primary rock types include amphibole and plagioclase gabbros, and olivine and amphibole gabbronorites. Pyrrhotite and chalcopyrite occur as primary magmatic inclusions hosted in amphibole, plagioclase, clinopyroxene, orthopyroxene, and oxides. Pyrrhotite and chalcopyrite are also present as secondary interstitial sulfides that are texturally distinct from the cumulate assemblages and are likely the result of degassing of host volcanic rocks. Sulfur isotope compositions ($\delta^{34}S$, ‰ relative to VCDT) of pyrrhotite and chalcopyrite were determined by SIMS at the WiscSIMS facility using a 3 μm beam size for 153 spots in magmatic inclusions, and 60 spots in interstitial sulfides.

$\delta^{34}S$ values in magmatic sulfides from St. Kitts, Guadelope, Dominica, St. Vincent, Carriacou, Ronde, and Grenada range from -2.25 to +5.15 ‰. Magmatic sulfide from Bequia has a range of $\delta^{34}S$ values from -8.69 to -7.6 ‰. The magmatic sulfides are consistent with the range of $\delta^{34}S$ values for melt inclusions reported from St. Vincent (-9 to +7 ‰, avg. 1.1 ‰; [1]). The most negative values likely represent biologically-fractionated sulfur from subducted sediments. $\delta^{34}S$ values in interstitial sulfides from St. Kitts, Antigua, St. Vincent, and Canouan range from -1.51 to +16.81 ‰, likely due to degassed sulfur during ascent of the the host magma.

[1] Bouvier et al. (2008) J. Pet.