Sulphur isotopes in carbonatites and associated silicate rocks from the Superior Province, Canada

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$\delta^{34}S_{CDT}$ analyses from six carbonatite-alkalic rock complexes from the Superior Province of the Canadian Shield, 1906 Ma to 1008 Ma in age, range from +3.4 to −4.5‰. Each complex possesses its own distinct range and mean S isotopic composition. Pyrrhotite, chalcopyrite and pyrite mineral separates were used. Published ranges for each complex are as follow: Schryburt Lake, −4.5 to −3.4‰ (mean = −3.9‰, n=6); Big Beaver House, −1.5 to −3.6‰ (mean = −2.2‰, n=7); Cargill, +0.5 to −1.5‰ (mean = −0.7‰, n=9); Spanish River, −0.1 to +0.1‰ (mean = 0.0‰, n=3); Firesand River, +1.3 to +3.4‰ (mean = +1.7‰, n=9). A sample from Carb Lake yielded a $\delta^{34}S_{CDT}$ value of +2.8‰. Petrological and petrochemical observations suggest that the S isotopic differences for each complex can be attributed to different modes of emplacement and differences in melt differentiation rather than source heterogeneities. Most of the complexes studied are associated with ultrabasic silicate rocks. The $\delta^{34}S_{CDT}$ of ultrabasic samples from three of the complexes range from −2.0 to +1.7‰. Of these complexes two (Big Beaver House; n=4 and Cargill; n=2) possess more primitve average $\delta^{34}S_{CDT}$ values than the associated carbonatites, while in the case of Firesand River (n=3), both the ultrabasic rocks and the carbonatites have similar average $\delta^{34}S_{CDT}$ values. In the case of Cargill & Big Beaver House such a relationship suggests that not only are the carbonatites and ultrabasic rocks within an individual complex intimately related, but that the carbonatites may represent the final products of magmatic differentiation. The overall range in $\delta^{34}S_{CDT}$ values along with C and O isotopic data from co-existing calcite ($\delta^{18}O_{V\text{-}SMOW}$ =+6.88‰, $\delta^{13}C_{V\text{-}PDB}$ =−5.15‰; n=28), suggest that carbonatites and associated silicate rocks were derived from a relatively primitive mantle source. This is consistent with previously published Sr and Nd isotopic data that the mantle source underlying the Superior Province has remained essentially a closed chemical system for the last 2800 Ma.

Petrology and geochemistry of Chah–Salar granitoidic pluton (SW Neishabour, NE Iran)

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Chah Salar granitoidic pluton is located in the SW of Neishabour and in the N of Chah-Salar village. Based on the field observations, petrography and geochemical classification diagrams, diorite, quartzdiorite, granodiorite, granite include the lithological composition of this pluton. Granites are very fractionated end-members of this rock association which they are intruded in this pluton such as dike or apophyse. Granitic pegmatite and their associated quartzolite are the most differentiated end-member of this lithological composition range. Their subvolcanic equivalents such as pyroxene-bearing andesite, andesite, trachyandesite and dacite cut this pluton such as dike or dome. These rocks show a variation of the granular, myrmekitic, graphic, porphyritic, microlitic porphyry and pilotaxitic textures. Except than granites, the other lithological compositions, on the variation diagrams of major, trace and rare earth elements versus SiO_2 or differentiation represent continuously compositional variations. Variation trends on the compatible and incompatible diagrams versus each other shows that this compositional continuity resulted of fractional crystallization. Geochemical characteristics show that Chah Salar pluton has calc-alkaline and metaluminous nature and it belongs to I-type granitoids. Discrimination diagrams of the tectonic setting indicate that the Chah Salar granitoidic pluton belong to volcanic arc granitiods (VAG) and also island arc granitoids (IAG). Detailed investigations of field geology, petrography and geochemical characteristics indicate magma-forming of this pluton is resulted from partial melting of subducted amphibolitic oceanic slab or metasomatized mantle wedge and then they evolved by fractional crystallization, magma contamination or magma mixing.