Fluids and the REE and O-isotopes of albitite, jadeitite and jadeite

S.S. SORENSEN[1], V.B. SISSON[2] AND G.E. HARLOW[3]

[1]Dept. Min. Sciences, NMNH, Smithsonian Inst. Washington DC 20560 (sorensen@si.edu)
[2]University of Houston, Houston TX (j_sisson@netzero.com)
[3]AMNH, NY, NY (gharlow@amnh.org)

Jadeite grains and whole-rock jadeitite and albitite specimens from localities around the world were analyzed for rare earth elements (REE)—and in some cases, also for their oxygen isotope ratios—by means of the ion microprobe and inductively coupled plasma-mass spectrometry (ICP-MS). The REE dataset includes more than 150 ion microprobe analyses and about 30 whole-rock analyses.

Oxygen isotope signatures of jadeite vary from about 4.6 to 9.3; similar to those of both seafloor-altered serpentinite and pillow basalts. Only isotopically heavy samples contain REE above detection limits; these have widely varying patterns.

Some bulk samples display negative Ce anomalies, elsewhere interpreted as a seawater signature. Other jadeitites contain low-salinity aqueous fluid inclusions; their REE might be sourced by seawater-hydrated rocks. Albitites and a few whole-rock jadeitite samples show positive Eu anomalies.

REE abundances range from 0.1 to 10 times chondritic values. Both rock types and the single-jadeite-grain ion probe data span this range, which makes it unlikely REE are derived from accessory minerals. Analyses of jadeite grains from the Nansibon Mines, NW Burma yield LREE-rich patterns, in contrast to abyssal clinopyroxene. Even though these represent calcic compositions for jadeite, the patterns appear to reflect a fluid component that is LREE-rich at 10x chondrite, i.e., a piece of evidence supporting fluid-transported REE signatures of arc basalt.

The secret magmatic history of Archean anorthosites told by Lead isotopes in plagioclase

A.K. SOUDERS[1], P.J. SYLVESTER[1] AND J.S. MYERS[2]

[1]MicroAnalysis Facility, INCO Innovation Centre, and Department of Earth Sciences, Memorial University, St. John's, NL A1B 3X5, Canada (kates@esd.mun.ca)
[2]Department of Applied Geology, Curtin University, Perth, WA 6845, Australia

Archean anorthosites and associated leucogabbro, gabbro and ultramafic units commonly form layered, sheet-like bodies within many Archean greenstone belts and high-grade gneiss terranes. Subsequent granitoid intrusion and deformation has obscured the original layered structure yet igneous mineralogy, textures, and structures, as well as contact relationships are still preserved. Equidiminsional plagioclase megacrysts ranging from ~0.5 to 30 cm in diameter are distivtive of Archean anorthosite complexes. These megacrysts have generally homogeneous, highly calcic compositions ($An_{80+/-5}$). The Fiskenaesset anorthosite complex (~2850 Ma) represents one of the best-preserved Archean anorthosite complexes. Within the Fiskenaesset complex, one of the best-preserved stratigraphic sequences is at Majorqap qava. The rocks in this area define most of the stratigraphy of the Fiskenaesset complex and have been used as a model for layered Archean anorthosite bodies in general. A new analytical technique using laser-ablation multi-collector inductively coupled plasma mass spectrometry (LA-MC-ICPMS) allows us to measure *in situ* Pb isotope ratios in preserved igneous plagioclase from the Fiskenaesset complex to evaluate the magmatic evolution of the body. Pb isotope ratios are determined by the static measurement of all Pb isotopes and ^{202}Hg in multiple ion counters (MICs). Using MICs extends the ability to measure $^{206, 207, 208}$Pb/^{204}Pb and ^{207,208}Pb/^{206}Pb ratios in "Pb-poor" materials (<<50 ppm total Pb). Prior to isotopic analysis, thin section petrography, and cathodoluminescence (CL) and back-scattered electron (BSE) imaging are employed to identify the best-preserved, primary igneous material. Representative samples have been chosen from all stratigraphic units to evaluate both vertical and lateral variation in Pb isotopic signature throughout the Fiskenaesset complex. Results indicate the parent magma to both the lower and upper leucogabbro units is isotopically heterogeneous with μ-values between depleted mantle and an ancient, low- μ source (μ =6). The anorthosite unit, located stratigraphically above the two leucogabbro units, has higher ^{207}Pb/^{204}Pb and lower ^{206}Pb/^{204}Pb ratios, suggesting crustal assimilation or replenishment from a more radiogenic source.