Online Proceedings

POSTER SESSION 2

MGH 258, Easel 185

1:00 PM to 2:30 PM

Modeling of Magma Differentiation in Kilauea Iki Lava Lake by MELTS

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Kilauea Iki Lava Lake, a lava lake in Hawaii Island, was formed during the summit eruption of Kilauea Iki caldera from late 1959 to early 1960. It has been a closed system since the event since no material was added after its formation, and it then became an excellent place to study magma differentiation. During cooling, different minerals cool at different temperature due to their difference in composition, and magma gradually differentiate along with temperature decrease. Thus, by knowing the primary composition of the magma, the differentiation pattern can be indicated. In order to observe differentiation process, the changes in oxide content in the remaining liquid were compared with MgO, the temperature-related oxide. In this project, MELTS, a software package designed by Mark.S.Ghiorso is used for my analysis. By utilizing MELTS, weight percentage of oxides vs MgO models can be calculated with known primary composition and assumed temperature, pressure and volatile content. After adjusting the model by comparing with real sample data of cooled lava, reliable models of content of oxides can be generated to be a strong indicator of differentiation process, and can be used in future studies of Kilauea Iki Lava Lake.

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Column Calibration for Boron Isotope Geochemistry

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The main control of ocean acidity is the concentration of dissolved CO_2, which depends on the concentration of CO_2 in the atmosphere. CO_2 is a greenhouse gas that plays a vital role in climate change. Boron isotopes in marine carbonates can be used as a paleo-pH proxy for the oceans, and therefore can shed new light in paleo-climate reconstruction. A method that accurately and precisely analyzes boron isotopic compositions must be developed before analyzing any natural samples. This study aims to establish an optimized boron extraction procedure that is done by column chemistry using boron specific resin (Amberlite IRA-743). This resin has a high affinity to boron at pH $>$ 5 and will be bound to the resin. Lowering the pH will decrease the resin's affinity for boron and release it from the resin. In this calibration we tested three mirco-columns (made in house) of our standard (NIST- SRM951a) in a slightly basic solution (pH ˜8) and then elute them with H_2O and HNO_3 through the columns. Each column is eluted with 100μl of 1N HNO_3 10 times and collected. Inductively-Coupled Plasma Mass Spectrometry (ICP-MS) is then used to determine the total recovery rate and how many times the column must be eluted to get 100% yield. This column calibration procedure is an important step towards quantitative analysis on boron in natural carbonate samples.

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Potassium Isotopic Composition of Seawater

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Stable isotope geochemistry is a powerful tool used to track changes in elemental composition of rocks to understand geologic history. A few of the more popular elements analyzed by geologists include magnesium and iron. Potassium analysis is a relatively new technique offering opportunities to delve into questions of continental erosion. My research project will aid in the development of potassium as a useful isotope tracer. I am determining the potassium isotopic compositions of 40 seawater samples with column chemistry methods and multi-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) to investigate the homogeneity of potassium isotopes in seawater and the subsequent mixing potential of the Earth's oceans. I chose my samples with

the goal of providing a wide distribution of data both spatially and vertically within the water column, including seawater from the Gulf of Mexico, southern Hawaii coast, and the greater Pacific and Atlantic Oceans. Potassium composition of the oceans is controlled by river and groundwater input of crustal material. Considering that potassium has a residence time (˜12 Ma) orders of magnitude larger than the hypothesized mixing time of the oceans (˜10 ka), the data should show a homogeneous potassium composition of seawater consistent with globally circulating ocean currents and a steady-state marine potassium budget. Presently, there is no global seawater potassium isotope literature value; previous studies have limited investigations to variability of potassium compositions in crustal, igneous or biological samples. Seawater is a useful geostandard for isotopic analysis because it is a readily available and vast resource that can be easily sampled and processed. The primary goal of this project is to provide a global seawater literature standard for future potassium isotopic analysis, given that my data will indicate homogeneous, well-mixed oceans representing an all-inclusive average of global potassium composition with a natural range of variation.