**Bromine partitioning between olivine, orthopyroxene and melt at MORB and OIB source conditions**

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The volatile and incompatible behaviour of the heavy halogens, chlorine, bromine and iodine, makes them excellent tracers for volatile transport processes in the Earth’s mantle. Knowledge of the budget and distribution of bromine and iodine in the Earth’s mantle is, however, very limited due to their extremely low abundances in the major mineral phases and a lack of well-defined partition coefficients that describe their behaviour during partial melting in MORB and OIB source regions.

We performed high-pressure-temperature experiments at 1 and 10 GPa and between 1573-1873 K to simulate partial melting of a peridotite-analogue (CMS) that was doped with heavy halogens Cl, Br and I at Earth upper mantle conditions. Microprobe analyses of the analytical run products reveal that they contain olivines and orthopyroxenes that are embedded in a glassy matrix, which represents a quenched melt.

Expected Br concentrations in olivine and orthopyroxene are likely well below 1 ppm. Therefore, a direct conventional analysis of Br concentrations is not possible due to a lack of well-defined standard materials and detection limits of most analytical methods that are above the expected Br concentrations in the minerals. Neutron irradiation noble gas mass spectrometry (NI-NGMS) is a technique that is capable of detecting extremely low halogen abundances in geological materials. This technique requires neutron-irradiation of the sample to produce excess noble gas isotopes from halogen isotopes within the sample based on (n, 𝛾/𝛽) reactions. As an example, neutron irradiation converts 79,81Br to 80,82Kr, so that the analysis of excess Kr isotope concentrations allows us to calculate bromine concentrations. While the NI-NGMS technique is already well established (Johnson et al. 2000), it has to date only been applied to bulk terrestrial samples. Here we tried for the first time to measure the bromine concentrations of individual experimentally derived terrestrial phases. For this, the NI-NGMS technique was coupled with a UV-laser ablation technique. A standardization is then required to determine the Br concentration in individual phases. The Mg and Ca concentrations of all phases of interest were analysed with an electron microprobe before the actual irradiation. 24,25Mg is converted to 21,22Ne during irradiation and 40Ca to 37Ar. Thus, the analysis of excess 21,22Ne and 37Ar allows us to calculate the ablated sample volume, which will in turn enable us to calculate the respective Br concentrations in materials of interest.

First results show that bromine behaves indeed very incompatible with partition coefficients between olivine/orthopyroxene and silicate melt being well below 10-3 at MORB and OIB source regions. Furthermore, olivine seems to be the main carrier mineral for bromine in the Earth’s upper mantle while orthopyroxene plays only a minor role.

A combination of our newly determined partition coefficients with already known bromine bulk rock concentrations in Mid-Ocean-Ridge-Basalts and Ocean-Island-Basalts will allow us to better estimate the budget and distribution of bromine in the Earth’s mantle.

Johnson, L., Burgess, R., Turner, G., Milledge, J.H., Harris, J.W., 2000. Noble gas and halogen geochemistry of mantle fluids: comparison of African and Canadian diamonds. Geochim. Cosmochim. Acta 64, 717–732.