Oxygen isotope analysis of experimental glasses by SIMS: A calibration attempt

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Analysis of oxygen isotopes in minerals is increasingly performed by Secondary Ionisation Mass Spectrometry (SIMS) [1, 2, 3, 4]. However, the application of SIMS to analyse $\delta^{18}O$ values in silicate glasses has been limited due to calibration difficulties related to the highly variable chemical composition of different glasses. In response to this problem, we have initiated the synthesis of a set of glass standards, selected natural samples and other existing experimental glasses [5] for a large-scale calibration program. To date we have fused a series of natural rhyolitic and phonolitic rock powders to produce the first experimental glasses, which have been tested for homogeneity by Electron Microprobe (EMP). We subsequently determined their $\delta^{18}O$ values using: a) a conventional silicate oxygen extraction line, b) laser fluorination and c) SIMS. The data we present here complements other recent SIMS studies of silicate glasses [6] and represent the first stage in our long-term efforts to develop a new SIMS analytical protocol. We plan to expand our glass standards to encompass intermediate to mafic glass compositions. Ultimately this work will significantly contribute to the fields of oxygen isotope geochemistry by SIMS, which can be used not only to study glasses in natural and synthetic systems [e.g. 7, 8], but will have a wide utility for geochemistry and geology in general.

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Early Cretaceous bimodal magmatism in Tonghua area, Jilin province, China: Implications for the destruction of the North China Craton

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Chronological, geochemical and zircon Hf isotopic data of the Early Cretaceous granitoids, diabases, and gabbros in the Tonghua area, Jilin province, China, provide insights into the spatial extent of the destruction of the North China Craton (NCC). LA-ICP-MS zircon U-Pb dating results indicate that the granitoids, disbases, and gabbros emplaced in the Early Cretaceous (115-134 Ma), consistent with the timing of the intensive magmatism in eastern China in the Mesozoic [1].

The Early Cretaceous granitoids consist chiefly of granite-porphyry. Chemically, they display high SiO_2, and rich in alkali and are characterized by enrichment in LREEs and LILEs, and depletion in HREE, and Ba, P, Ti and Eu, smilar to A-type granite. ε_{Hf} (t) values and Hf model ages of zircons from the granitoids range from -10.8 to -20.8 and from 1.9Ga to 2.5Ga, respectively, indicating that they were mainly derived from the partial melting of the Neoarchean-Paleoproterozoic basement rocks within the NCC.

In contrast, the Early Cretaceous diabases and gabbros exhibit low SiO_2 and high Mg#, and high Cr, Ni and Sc contents, and are characterized by enrichment in LILEs, depletion in HFSEs and P, and no Eu anomaly. They belong chemically to tholeiitic series. The above-mentioned geochemical data indicate that these mafic igneous rocks could be derived from partial melting of the metasomatized lithospheric mantle.

The Early Cretaceous granitoids, diabase, and gabbro in the Tonghua area consititute a bimodal igneous rock association, implying an extensional setting. Combined with the researches on the coeval granitoids and mafic-ultramafic rocks in eastern Liaoning Peninsula [1, 2], we propose that the spatial extent of the NCC destruction should include the northeastern segment of the NCC.

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