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In situ Rb-Sr geochronology using MC-ICP-MS/MS

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ICP-MS/MS equipped with collision cell technology (CCT) enables the separation of isobaric ions using reactive gases. Applications using multi-collection mass spectrometers (MC-ICPMS/MS) were recently developed for *in situ* ^{87}Rb-^{87}Sr geochronology of K-bearing minerals in terrestrial granites [1], a martian polymict breccia [2], and a single biotite grain [3]. We present here results obtained using a Thermo Scientific Neoma MC-ICP-MS/MS, coupled with an ESL NWR193 excimer laser ablation system, at the Bayerisches Geoinstitut. High-purity He and SF_6 gases were mixed in the CCT to react with Sr, producing SrF isotopic species at a ~99% conversion rate. The $^{85,87}Rb^+$, ^{88}Sr, and $^{103,105,106,107}SrF^+$ ions were measured in static mode. To correct the instrumental mass bias during sample measurements, we used a glass standard (NBS 610) to correct for Rb/Sr fractionation, and a labradorite standard (AMNH-107160) for correcting ^{87}Sr/^{86}Sr isotopic ratios of feldspars. The laser spot conditions were similar to [2] and data reduction as in [3].

We analyzed plagioclase and K-feldspars from Dartmoor granite to obtain a Rb-Sr internal isochron (^{87}Sr/^{86}Sr=0.7091±6 comparable to 0.7094±2 by TIMS [4]). The slope of the isochron provides a correction factor based on the Dartmoor granite age (284±1 Ma [1]). This factor was applied to the plagioclase and K-feldspar mineral isochron for the Shap granite, resulting in an age of 405.5±4.5 Ma (MSWD=1.1, n=32), which is consistent with the 400±3 Ma whole-rock, feldspar and biotite isochron age reported by TIMS [1,4]. Our ^{87}Sr/$^{86}Sr_0$ (0.7084±2) is similar to the value of 0.7082±3 from [2], but slightly higher than 0.70755±4 and 0.70767±10 determined for Shap from [1] and [4] (including biotites), respectively. This difference could be explained by the fact that we did not analyze as many plagioclase grains and no biotite. Further development and applications of this technique in extraterrestrial samples will be presented at the meeting.

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