## In Situ Rb-Sr Dating of Hydrothermal Mineral Deposits by LA-ICP-MS/MS

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The ages of alteration and mineralization are important for both economic geology research and mineral deposit exploration. K-bearing minerals such as biotite, muscovite, illite, K-feldspar, alunite, and some amphiboles are common alteration minerals in many deposit types. Such minerals are currently dated using Ar-Ar or K-Ar methods. With the new generation triple quadrupole ICP-MS/MS, it is now possible to achieve online separation of $^{87}Rb$ and $^{87}Sr$ and thus allow in-situ Rb-Sr dating of these minerals with laser ablation sample introduction.

In this study, we used LA-ICP-MS/MS to determine Rb-Sr ages of micas from 7 hydrothermal deposits with known ages (306 Ma to 1.4 Ma), to test the capabilities of this technique. The separation of $^{87}Sr$ from $^{87}Rb$ was achieved using $N_2O$ cell gas. The isotopic ratios were calibrated with Mica-Mg-NP and NIST 610. Uncertainties in all steps were incorporated into the final uncertainty. The results showed that the Rb-Sr dating of micas can achieve accuracy of <1% deviation from the known ages. The isochron age precision is typically ~1 to 1.5% (at two sigma level) for minerals with ages older than 40 Ma, and ~15% or worse for minerals younger than 20 Ma, which is likely because of (1) the low radiogenic Sr due to the short accumulation time, and (2) the narrow range of $^{87}Rb/^{86}Sr$ ratios in the samples. As compared to the Ar-Ar dating, this technique has shorter turnaround time and larger throughput, plus higher closure temperature (>500 °C), making the Re-Sr system more likely to survive in the later thermal events than the Ar-Ar system (closure T ~350 °C). These features make the LA-ICP-MS/MS in situ Rb-Sr dating suitable for geochronologic studies of mineral deposits.