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Muscovite reference materials for *in situ* Rb-Sr geochronology

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The rise of *in situ* Rb-Sr dating of micas by LA ICP-MS/MS has heightened the need for secondary reference materials spanning a variety of dates that are well characterized, isochronous, and available in sufficient quantities. Numerous samples in the phlogopite-annite series, such as LaPosta biotite, Mt. Dromedary biotite, MDC phlogopite, and McClure Mountain biotite, have been investigated and distributed for use as secondary Rb-Sr reference materials. However, there remains a paucity of white mica reference materials. Here we investigate seven muscovite samples from the Lord Hill pegmatite quarry, Stoneham, Maine, USA, including the Harvard 98973 muscovite [1] recently dated by TIMS [2], and two samples from Svecofennian pegmatites from Sweden, and assess their suitability as secondary reference materials for Rb-Sr geochronology. *In situ* Rb-Sr dates were determined using an ESI imageGEO^{193} excimer laser coupled to an Agilent 8900 ICP-MS/MS. To correct for matrix-dependent elemental fractionation, muscovite dates were age-corrected to the WCM-1 muscovite (306 Ma). Harvard muscovite 98973 has previously been analyzed by TIMS and dated to 266.8 ± 1.6 Ma; we determined a date for Harvard 98973 of 255.40 ± 0.24 Ma (MSWD=27, n=90). Six muscovite samples from Lord Hill give dates of 261.5 ± 0.3, 260.9 ± 0.4, 255.0 ± 0.9, 253.0 ± 0.9, 239.1 ± 0.6, and 230 ± 1 Ma; biotite from Lord Hill gives a date of 257 ±1 Ma. Additionally, two albite samples from Lord Hill give $^{87}Sr/^{86}Sr$ of 0.7254 ± 0.0094 and 0.750 ± 0.014. The dates obtained are consistently younger than the TIMS date and differ from each other, and Harvard 98973 has a particularly high MSWD, suggesting the presence of multiple generations of muscovite in Harvard 98973 and across the Lord Hill quarry. Muscovite samples from Drömgruvan and Üto, Sweden were dated to 1734 ± 5 (MSWD=1.64, n=53) and 1841 ± 6 Ma (MSWD=5.45, n=59); the lower MSWDs and large spread in $^{87}Rb/^{86}Sr$ in these two samples suggests they may be good candidates for confirmation by TIMS analyses.

[1] Dyar et al. (2001), *Geostand Geoanal Res 25*, 441–463.
[2] Kutzschbach et al. (2024), *J. Anal At Spectrom 39*, 455.