Analytical Electron Microscopy and the Problem of Potassium Diffusion[1]

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Abstract: Diffusion of K during analytical electron microscopy (AEM) results in anomalously low count rates for this element. As the analysis area and specimen thickness decrease, count rates become disproportionally lower. Adularia and muscovite show different diffusion profiles during AEM; for muscovite a strong dependence of diffusion on crystallographic orientation has been observed. Conditions giving rise to reliable chemical data by AEM are the use of a wide scanning area (>800 x 800 Å) and/or large beam size to reduce the effect of diffusion of alkali elements, a specimen thickness greater than about 1000 Å, constant instrument operating conditions, and the use of a homogeneous, well-characterized standard sample. The optimum thickness range was obtained by determining the element intensity ratio vs. thickness curve for given operating conditions. The standard and unknown should have a similar crystal structure and, especially for strongly anisotropic minerals such as phyllosilicates, a similar crystallographic orientation with respect to the electron beam.

Key Words: Adularia • Analytical electron microscopy • Diffusion • Muscovite • Potassium • Transmission electron microscopy

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