

## **Chemical control of 3T stacking order in a Li-poor biotite mica**

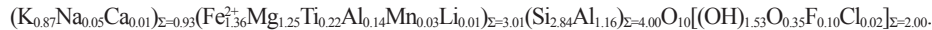
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### **ABSTRACT**

The microstructural features of a biotite (Mg-rich annite) crystal from dacite rocks of Džep, Serbia, were studied by X-ray diffraction topography (XRDT) and high-resolution and analytical transmission electron microscopy (HRTEM and ATEM, respectively). The average chemical composition, obtained by electron microprobe analysis (EMPA) and secondary-ion mass spectrometry (SIMS) data, is



Inhomogeneous regions from either different polytypes or twins were mapped by XRDT, and these images were used to guide sampling for TEM analysis. Three stacking arrangements, each belonging to subfamily-*A* of mica polytypes, were identified by selected area electron diffraction (SAED) patterns and HRTEM images: (1) dominant semi-random  $1M_n$ -*n*(120°), including an occasional repetition of long-period inhomogeneous stacking sequences belonging to the 3T structural series; (2) highly faulted  $2M_1$ , sometimes with short-range-ordered long-period inhomogeneous sequences based on the  $2M_1$  structural series; and (3) perfectly ordered 3T stacking repeating over long distances (several micrometers). ATEM data revealed that the microchemical composition of 3T differs from that of the host matrix. The 3T is enriched in interlayer cations (K and Na), and depleted in Si and octahedral cations. No evidence of Li was detected. Compositional control on the stability of 3T stacking is suggested.

**Keywords:** Polytypism, biotite, electron microscopy, chemical analysis