

## **Direct identification of the six polytypes of chlorite characterized by semi-random stacking**

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### **ABSTRACT**

This paper demonstrates that the six standard polytypes of chlorite, whose definitions are based on the orientation of the interlayer sheet and the position of the interlayer sheet on the 2:1 layer, can be discriminated by atomic-resolution images recorded down [010], using a transmission electron microscope with a  $\sim 2$  Å point resolution and digital image processing. Several specimens were investigated to reveal their local stacking structures. A *Ibb* chlorite is highly twinned and twin boundaries consist of a *IIb*+*Ia* stacking sequence at the interlayer sheet. An interstratified chlorite/biotite formed by hydrothermal alteration from biotite in granite consists of a mixture of several chlorite polytypic sequences, including *Iab*, *Ibb*, *IIab*, and *IIbb*. These polytypic details of chlorite and other sheet silicates provide important insights into mineral stability, origin, and reaction mechanisms.