

**LETTERS**

**Pristine surface growth features on 100 Ma garnet phenocrysts: Interference imaging results**

**THOMAS H. PEARCE\***

Department of Geological Science and Geological Engineering, Queen's University, Kingston, Ontario, Canada

**ABSTRACT**

Microstructures of crystal surfaces can reveal growth mechanisms. However, original surfaces of phenocrysts are rare because they are commonly covered with glass or rock matrix. In an unusual occurrence, microscopic growth features are clearly visible on original surfaces of 100 Ma melanite garnet phenocrysts of the Crowsnest Formation, Alberta, Canada. Such details as the steps of growth pyramids are clearly resolved at the 100 nm scale (vertically) in reflected-light Nomarski differential interference contrast (NDIC). However, because of the small step size (<0.5 micrometers), these features are not resolved in transverse section using a transmitted-light polarizing microscope. In transmitted-light microscopy, growth features of a thin-section appear indistinguishable from oscillatory zoning. These results suggest that, in general, oscillatory zoning may be surface growth forms seen in transverse section. Growth of the Crowsnest phenocrysts was both lateral and intermittent along the crystal face rather than continuously outward from the face, an observation of considerable significance to the theoretical modeling of natural crystal growth. This empirical study should alert other workers to the possibility of studying crystal growth using natural magmatic crystals. In particular, this unique Crowsnest material would repay study by diverse techniques.