American Mineralogist, Volume 96, pages 319–328, 2011

Origin of crosscutting dissolution surfaces in magmatic plagioclase

Akira Tsune*

Deep Ocean Resources Development Company, Ltd., 1-3-15, Nihonbashi-Horidome-cho, Chuoh-ku, Tokyo 103-0012, Japan

Abstract

Crosscutting dissolution surfaces (DSs) are rare features observed in magmatic plagioclase crystals. In this study, crosscutting DSs of dacitic plagioclase crystals from the Shirahama Group, Izu Peninsula, Japan, were investigated using a Nomarski differential interference contrast imaging microscope and chemical compositional data. Crosscutting DS slopes were examined by tracing digitized images. The following features of crosscutting DSs are reported for the first time: (1) traces of the crosscutting DSs showed parabolic-like shapes; (2) crosscutting DSs were found on select (adjacent or opposite) faces of the crystals suggesting a preferential dissolution of a limited area of the plagioclase; (3) projecting points were observed with directional characteristics; and (4) square or angular patterns were found in the less dissolved parts of the crystals. The formation of crosscutting features is controlled by dissolution and crystal settling into hotter magma. Process velocities depend on the physical properties of the magma, such that a description of crosscutting features can reveal valuable information about the magmatic environment and the dynamic behavior of crystals.

Keywords: Plagioclase, dissolution surface, oscillatory zoning, crystal settling, crystal dissolution