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MEGACRYSTALS FROM MAGMA: A MICROANALYTICAL APPROACH TO INVESTIGATING MEGACRYSTIC CRYSTALLIZATION PROCESSES

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The solidification of magma is a fundamental process through which Earth's crust formed. The crystal record of these magmas offers an integrated micro-scale textural, chemical, and chronological record of magmatic processes. In this study, a suite of megacrystic (>2.5cm) alkali feldspars hosted in granite from the Sheephole Wilderness area of southern California provide an opportunity to investigate these processes. By studying the textural, mineralogical, and chemical composition of these megacrystic alkali feldspar crystals and their accessory phase populations new insights into magmatic processes associated with the evolution of granitic magmas and the growth of megacrystic phases will be gained. Throughout the alkali feldspar megacrysts, inclusions of quartz, biotite, and oxides are common with rarer amphibole in addition to accessory titanite, apatite, and zircon. Through compositional mapping of megacrysts via micro Xray Fluorescence (XRF), crystal-scale textural associations and broad-scale compositional zonation of the megacrysts will be evaluated. In-situ quantification of minor and trace elements from crystal core to rim will be quantified via Laser Ablation inductive Couple Plasma Mass Spectrometry (LA-ICP-MS) and will be used to investigate chemical changes during crystallization. The chemical evolution of the magma from which these megacrysts were derived will also be evaluated via in-situ elemental analysis of accessory titanite, apatite, and zircon via LA-ICP-MS. These three accessory phases in particular also present a future opportunity to date the timing of megacrystic crystallization, and the timescales over which this occurs, via application of U-Pb geochronology. Through a detailed, integrated microanalytical characterization of this suite of megacrystic feldspars our understanding of the chemical processes and timescales over which magmas crystallize in Earth's crust will be advanced.

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