115-8 - K-FELDSPAR MEGACRYST MINERAL INCLUSIONS AND THEIR ZONING PATTERNS, TUOLUMNE INTRUSIVE COMPLEX, SIERRA NEVADA, CA

Monday, September 23, 2024

8:00 AM - 5:30 PM

Hall D (Anaheim Convention Center)

Abstract

Modern mineral-scale geochemical analyses show that they contain a large amount of information on the complex nature of the construction and evolution of large and long-lived magmatic bodies. Mineral inclusions trapped in particularly large magmatic crystals like several cm long K-feldspar megacrysts can add additional layers of information that further inform on the evolution of the magma that the crystals grew in over time.

The Tuolumne Intrusive Complex (TIC) is a 95-85 Ma, ~1,100 km^2, temporally and compositionally zoned plutonic body in Yosemite National Park. It is largely composed of granodioritic units, including the porphyritic Half Dome (pHD) and the Cathedral Peak (CP) granodiorites, which contain K-feldspar megacrysts as large as 3-4 cm long in the former and 15 cm in the latter. These megacrysts typically contain smaller (< 1 cm) mineral inclusions of rock-forming and accessory minerals such as plagioclase, hornblende, biotite, quartz, sphene, zircon, and apatite that are typically aligned with their long axes parallel to growth zones in the megacrysts. The type, size and distribution of the mineral inclusions vary across the megacrysts and in different parts of the TIC. The mineral inclusions are euhedral to subhedral and in places occur as mineral clusters.

Using petrographic analysis and cathodoluminescence imaging, this study examines mineral inclusions and their spatial relationship within the K-feldspar megacrysts and their relation to growth zones marked by Ba zoning from different parts of the TIC to determine magma body sizes, interconnectivity, and petrologic processes. Particular emphasis is put on the mineral assemblage and co-crystallizing mineral phases, the shape and zoning of the inclusions, and Ba zoning. Preliminary analyses show that while pHD megacrysts contain a large number of mafic minerals and sphene, those are largely lacking in the large megacrysts of the CP. CP megacrysts are dominated by plagioclase inclusions and only locally contain mafic mineral inclusion-rich cores associated with mixing across pluton boundaries. Plagioclase-only inclusions in the CP in combination with complex resorption patterns and truncations in Ba zoning may have recorded higher temperature magma processes (and megacryst growth) compared to those from the pHD and repeated magma recharge.

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