2-2 - TITANITE ZONATION RECORDS MAGMATIC TO AUTOMETAMORPHIC TRANSITION IN THE LITTLE COTTONWOOD STOCK, UTAH

Wednesday, May 17, 2023

8:25 AM - 8:45 AM

Whitney Peak Ballroom 1 (The Whitney Peak Hotel)

Abstract

Granite textures are usually assumed to be unmodified igneous features, but titanite petrochronoloy records a progression from magmatic crystallization to fluid-mediated automorphism in the Little Cottonwood stock (LCS). The Wasatch Mountains expose a profile through the 36-25 Ma Wasatch Igneous Belt owing to 20° eastward tilt in the footwall of the Wasatch Fault. The LCS, Alta stock (AS) and their contact aureoles form an integrated magmatic-hydrothermal system that underpinned the cogenetic Keetley Volcanics (KV). The AS (~3-5 km depth) likely formed a conduit from the deeper LCS (~6-11 km) to the KV. The LCS formed in two phases: 1) ~36–33 Ma, coeval with the AS and KV, and 2) ~32–25 Ma, younger than KV and AS but at this time hydrothermal fluid infiltrated the AS to form endoskarn. LCS titanite was analyzed by LASS-ICP-MS in 16 samples of unaltered granite (*s.l.)* collected along transects from the roof on the east to the deepest exposures on the west and from the northern wall to the southern wall. Principal component analysis of titanite trace-element data distinguishes a magmatic group with high REE and a metamorphic group with low REE and high W, Sr, Sc, V, Cr, Fe, Al, and Pb. The metamorphic group forms BSE-dark rims that are variably developed but present in every sample. U-Pb dates indicate that, across the sample suite, there is nearly complete age overlap between magmatic and metamorphic titanite. We interpret chemical zoning of the titanite to record magmatic crystallization followed by hydrothermal modification of primary minerals. The age overlap suggests that solidified increments were infiltrated by fluid released by crystallization of nearby later increments. Infiltrating fluids also affected the feldspars: although apparently intact when examined optically, CL images reveal the feldspars to have been shattered, then healed by dissolution-reprecipitation. Exsolution of Ab component from K-feldspar to form albite selvages against adjacent plagioclase probably was part of the same process, as were biotite chloritization and exsolution of Ti from primary titanomagnetite to grow metamorphic titanite. Taken together, observations from titanite and major phases are consistent with fluid-mediated submagmatic re-equilibration throughout incremental assembly of the LCS.

Geological Society of America Abstracts with Programs. Vol. 55, No. 4, 2023
doi: 10.1130/abs/2023CD-387369

© Copyright 2023 The Geological Society of America (GSA), all rights reserved.

Author

B

John Bartley
University of Utah

Authors

S

Michael A. Stearns
Utah Valley University

B

John R. Bowman
University of Utah

B

Carl J. Beno
University of British Columbia Okanagan

S

Emmaline Saunders
Utah Valley University

N

Sarah Nicholas
Utah Valley University

Presentation File(s)

Reno LCS talk 2023.pdf View Download

View Related