

V41A-02 - Petrochronologic Constraints on the Timing and Duration of Sill and Dike Emplacement and Associated Contact Metamorphism of Hornfels in the Alta Aureole, Utah, from Zircon and Monazite LA(SS)-ICP-MS



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Abstract

Two generations of dikes and sills (earlier granodiorite, later leucogranite) have intruded quartzofeldspathic to semi-pelitic hornfels in the innermost ~200 meters of the southern contact aureole of the Alta stock. Both zircon and monazite are present in the older granodiorite intrusions, and monazite alone is present in the younger leucogranite intrusions, and in biotite-rich reaction selvages formed by hydrothermal contact metamorphism in hornfels adjacent to these dikes and sills. U-Pb dates for zircon ($n=532$) range from ~38 to 32 Ma, with error on individual measurements of $\pm 1-1.5$ Ma, and define a KDE peak at 34.5 Ma. These zircon dates are slightly older than, but consistent with, existing zircon data from the Alta stock (35 to 32 Ma; Stearns et al., 2020), suggesting that the construction of the Alta stock began by emplacement of these granodiorite sills and dikes. Monazite Th-Pb dates ($n = 888$) range from ~41 to 28 Ma with error on individual measurements of $\pm 1-1.5$ Ma. These dates are complicated by disturbances to the U/Th-Pb systematics by common Pb (Pb_c) and excess ^{206}Pb due to ^{230}Th . Dates >38 Ma are disturbed by

significant Pb_c and do not represent crystallization ages. Dates from the granodiorites range from ~38–32 Ma. In individual samples of granodiorite where the disturbance from excess ^{206}Pb can be rigorously evaluated, the monazite data sets yield concordant ^{232}Th - ^{208}Pb and $^{207}Pb/^{206}Pb$ -corrected dates centered at ~35 Ma, consistent with zircon dates from these same samples. Monazite dates from the leucogranites are younger (<33 Ma), consistent with cross-cutting relationships (leucogranites cross-cut granodiorites). The monazite data from the leucogranite sills and dikes do not record magmatic or hydrothermal activity after ~29 Ma, in contrast to the titanite record of hydrothermal activity to as late as ~23 Ma in the border zone of the Alta stock and its endoskarns (Stearns et al., 2020). This absence suggests that once magma injection and associated contact metamorphism in the hornfels ceased, permeability in the hornfels decreased sufficiently by ~29 Ma to prevent subsequent infiltration of significant fluxes of hydrothermal fluid into these hornfels lithologies in the aureole.

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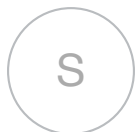
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