

# Melt Topology and Chemistry during Partial Melting in Contact Aureoles: an Experimental Study and Field example

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Partial melt generation within the highest grade metamorphic rocks of the Big Cottonwood (BC) formation in the Little Cottonwood (LC) contact aureole (Utah, USA) is due to a combined muscovite/biotite break down reactions in metapelitic rocks in the sillimanite stability field. It occurred close to water saturation. Melt extraction from massive pelites happened along fibrolite veins which are connected to pegmatite pods. In contrast, small pelite layers are now restites. They are surrounded by feldspar enriched quartzite zones.

Deformation is localized into the migmatitic zones. Melt was accumulated in extensional and tranpressional zones, like boudin necks, veins, and shear zones. Melt locally segregated into pegmatitic, granitic dykes. Transition between these dykes and quartzites is gradual. Here quartz grains have a rounded shape and each grain is bordered separated its neighbor by a thin feldspar rim. These textures document melt infiltration into massive quartzites. Interstitial feldspar and mica mimic the original melt distribution. X-ray tomography investigations showed that these melts formed an interconnected network in the quartzites.

EBSD measurements on quartz grains in the migmatite zone of the BC formation show a lack of quartz orientation despite abundant macroscopic deformation. The round quartz grains were not deformed in the melt matrix. Infiltration into the quartzites along the quartz grain boundaries led to a significant weakening of the quartzite and leads to a decompaction of the quartzites, which facilitates the incorporation of individual quartz grains into the melt. This mechanism can serve as a model to explain xenocrysts found abundantly in magmatic systems.