

High-temperature deformation and retrograde strain localization during cooling and exhumation of a gabbroic pluton in an Oceanic Core Complex (Hole U1473A, Atlantis Bank, Southwest Indian ridge)

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The crustal architecture of slow-spread ocean crust results from complex interactions between magmatism, tectonics and hydrothermalism. IODP Hole U1473A (789m depth) was drilled at the summit of the Atlantis Bank, a gabbroic massif exhumed at the Southwest Indian Ridge (SWIR), during IODP Expedition 360. From 6 samples, we conducted petrologic and petrographic studies of deformed gabbroic lithologies from the SWIR involving quantitative compositional mapping, complemented by thermodynamic investigations of deformation conditions (Pressure-Temperature-H₂O fluid) and EBSD analyses of all constitutive minerals.

High-temperature (HT) deformation is widespread in the gabbro and produced numerous plurimeter-scale sections of porphyroclastic microstructure, which are heterogeneously cross-cut by multiscale shear zones. A first episode of strain localization occurred in very similar conditions than that of porphyroclastic microstructure formation, as showed by limited chemical variations in the constituting phases (plagioclase, pyroxenes, olivine and amphibole). It is characterized by a grain size reduction, a slight increase of amphibole content, and a decrease of crystallographic preferred orientations strength fabric of all phases (except amphibole). A second episode of strain localization is marked by thinner centimeter scale shear zones, associated with fluid circulation promoting crystallization of up to 60 vol% retrograde amphiboles.

Thermodynamic modeling (using *Perple_X*) indicates granulitic condition for the first episode of HT deformation that led to the formation of porphyroclastic microstructures (860-880°C / 1.2-1.7 kbar). The second deformation episode occurred under upper amphibolite conditions (650-700°C / <1.5 kbar). These thermal and microstructural evolutions are consistent with deformation which was associated with the exhumation of the gabbro pluton now forming the Atlantis Bank. The results confirm an early onset of deformation under near-solidus conditions.

Mots-Clés: Gabbros ; Deformation ; XMapTool ; *Perple_X* ; Atlantis Bank ; Mid-Ocean Ridge.