

EGU21-11935

<https://doi.org/10.5194/egusphere-egu21-11935>

EGU General Assembly 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Texture Evolution of Amphiboles - a Case Study from the Mamonia Complex, Cyprus

Amir Topaz, Yuval Boneh, and Tzahi Golan

Ben Gurion University of the Negev, Earth Sciences, Israel

Amphibole's ubiquitous occurrence in the lower crust and subduction zones together with its anisotropic elastic and rheological properties makes its texture evolution essential for assessing the past and current tectonic regimes. Amphibole often display a typical crystallographic preferred orientation (CPO) where the crystals [001] axes align with lineation and the [100] axes align with the normal to the foliation plane. However, this common CPO was attributed to numerous different deformation mechanisms, such as rigid body rotation, dislocation creep, or dissolution precipitation, and there yet to be found a distinct relation between amphibole CPO attributes and the prevailing deformation mechanism. Here, we present a microstructural analysis using electron backscatter diffraction (EBSD) of a highly deformed amphibolite from the metamorphic sole of Mamonia complex in Cyprus in order to investigate texture evolution in amphibole-rich samples. Samples from two localities ~40 km from each other were analyzed: 'Agia Varvara' (AV), and 'Bath of Aphrodite' (BOA). The two amphibolites show well-foliated microstructure, comprised mainly of hornblende (50-70%), and plagioclase (20-30%) grains under similar calculated P-T conditions of ~600 °C and 6 kbar. Despite the similar compositions and conditions, there are significant differences in the overall texture between the two samples. Samples from AV show strongly clustered amphibole CPO, with the [001] axis forming a strong point maximum parallel to the lineation (X-axis) and the [100] axis aligned perpendicular to foliation (Z-axis). In addition, amphiboles are aligned with the lineation with relatively curved boundaries and moderate aspect ratio (~2). For samples from BOA, amphiboles grains show two distinct CPO types: axial [001], where the [001] is aligned parallel to the shear direction while [100] and [010] oriented along the Y-Z plane, and orthorhombic, where the [001] and [100] are aligned with the lineation and normal to foliation, respectively. In addition, amphibole are tabular-shaped, elongated grains with distinctively straight boundaries and high aspect ratio of ~3.5. Comparison between the AV and BOA grains with average misorientation spread of >1° shows higher fraction for AV (35%) than BOA (13%). We interpret the textural and microstructural analysis of the amphibolites to reflect different deformation mechanisms for AV and BOA. The lack of compositional zoning within hornblende grains suggests no significant deformation by dissolution precipitation for both AV or BOA. For AV, the strong CPO, curved grains boundaries, and high ratio of grains with intragrain misorientations suggest deformation through dislocation creep. Differently, in BOA, the observations of tabular-shaped amphibole grains, the low amount of intra-grain misorientations, along with shape and crystal orientations that vary together with [001] as the rotation angle suggest deformation by rigid body rotation.

