PLAGIOCLASE CRYSTALLIGRAPHIC PREFERED ORIENTATION AND SEISMIC ANISOTROPY IN HIGH-TEMPERATURE MYLONITES

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In this work, we used microstructural and textural analyses to evaluate aspects related to plastic deformation in plagioclase and the relationship between textures and seismic properties. The EBSD technique was employed to analyze the crystallographic preferred orientation (CPO) of feldspar in high-temperature mylonites from the Barro Alto complex. The Barro Alto complex is a continental-scale feature exposed in the Brasília Belt, which belongs to the Tocantins Structural Province in Central Brazil. This complex was formed by a mafic-ultramafic layered intrusion mylonitized and metamorphosed under granulite facies conditions. The samples are composed of porphyroclasts of plagioclase and diopside embedded in a fine matrix of plagioclase, clinopyroxene, orthopyroxene and, less commonly, amphibole and biotite. The plagioclase porphyroclasts exhibit undulose extinction and core-mantle structures. The samples were separated in two domainal microstructures: (1) large porphyroclasts (0.5 to 2 mm) surrounded by a very fine-grained mylonitic matrix (0.03 to 0.08 mm); (2) plagioclase with grain size ranging from 0.5 to 1 mm. Both domainal types also show a compositional layering of mafic and felsic components. In the first domain, CPO from the fine matrix plagioclase shows poles to the planes (100),(010),(001) randomly distributed, with a low concentration in {010} parallel to Z direction. The weak texture is confirmed also for a low J index (2.4). In the second domain, coarse plagioclase exhibits maximum of poles to {100} parallel to the X direction (stretching lineation) and poles to {010} parallel to the Z direction (pole to foliation). The J index is high (15.33). The microstructure and texture analyses suggest that different deformation mechanisms were active in each group. The weak texture observed in the finer-grained domain may be a result of diffusive processes. On the other hand, in coarser-grained domains dislocation creep may dominate, which led to the development of a stronger texture. In these domains the prime deformation mechanism is dislocation creep controlled by the [100](010) slip system, and secondarily by the [100](001) slip system. These results are consistent with the high-grade deformation conditions of the Barro Alto Complex. The seismic anisotropy patterns for the fine-grained domains present low value of P-wave velocity (Vp), being the fast velocity direction perpendicular to the foliation, while the S wave anisotropy is extremely low (1.1 to 3%). The mineral assembly and the deformation controlled by diffusion probably contribute to decrease the anisotropic behavior of these rocks, creating patterns similar to those found in an isotropic media. In the coarser-grained domains, the P-wave velocity is also low, but the strongest texture is directally reflected by the S-wave anisotropy (6-10%) and S1 polarization. The Vp distribution is dependet on proportion plagioclase/diopside in matrix and it is controlled by the b-axis of both minerals. We conclude that differences in grain size suggests a strong partitioning of deformation between diffusive processes in fine-grained aggregates, and dislocation creep in large grains aggregates and these differences are also perceived in seismic behavior of the aggregate.

KEYWORDS: DEFORMATION MECHANISM, SEISMIC ANISOTROPY AND EBSD.