Structural petrology of partially molten rocks emplaced within high-grade transpressional shear zones: Magnetic and CPO fabrics of the Espinho Branco anatexite (Borborema Province, NE Brazil)

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Transition from coarse high-grade mylonites to migmatitic rocks are found in the central domain of the Patos shear zone in NE Brazil. Although keeping the same dextral kinematics, these rocks show fabrics that vary in magnitude and orientation. The mylonites usually show a well-defined vertical foliation including a subhorizontal stretching lineation while in migmatites the deformation is heterogeneous varying from strongly oriented syntectonic shear zone-parallel leucosome veins to randomly-oriented nebulites and isotropic leucogranite accumulations of various shapes and sizes. A comprehensive petrostructural study including crystallographic preferred orientations acquired by Electron Backscattering Diffraction (EBSD) and Anisotropy of Magnetic Susceptibility (AMS) and Anhysteretic Remanence (AAR) were used to unravel the fabric evolution from the anatexites to the mylonites. AMS shows that ferromagnetic minerals dominate the overall susceptibility of the migmatitic rocks, although a few samples show composite contributions from ferro- and paramagnetic fractions. AAR from samples with mixed ferro- and paramagnetic contributions reveals coaxiality between AMS and AAR ellipsoids, indicating a single process for magnetic fabric acquisition. AMS lineations define a well-oriented fabric axis in which magnetic foliation planes rotate consistently with a dextral simple shear regime. The CPO of biotite crystals shows a good correlation of <001> axes with the k_3 direction of the AMS ellipsoid, also broadly consistent with the mean orientation of the migmatitic layering defined by the alternation of meso- and leucossomes. In contrast quartz CPO patterns show weak or no correlation with magnetic fabrics. These results indicate that despite structural heterogeneities observed in migmatites, magnetic fabric can be a good proxy of bulk deformation of partially melted rocks. The correlation between AMS and kinematic of the shear zone shows that complex migmatite geometries can reflect simple strain fields where both melt injections followed by local accumulations to form discordant magma lenses and pods can display a coherent syntectonic fabric pattern.

PALAVRAS-CHAVE: SINKINEMATIC ANATEXIS, RHEOLOGY, PETROFABRICS