RIBBONS FORMED BY PLASTIC SEGREGATION OF QUARTZ IN A HIGH GRADE SHEAR ZONE

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By analyzing quartz microstructures and c-axis fabrics, the development of polycrystalline quartz ribbons in striped gneisses from the high-grade Além Paraíba shear zone, in southeastern Brazil was investigated. Clustering analysis of quartz grains in samples with varied degrees of shear strain revealed that formation of ribbons was a mass conservative process, where isolated quartz grains were plastically segregated and coalesced to form polycrystalline ribbons. The resulting microstructure shows quartz ribbons separated by feldspar-rich domains devoid of quartz. The stage where the individual, stretched grains start to contact each other and initiate ribbon development represents a crucial microstructural change from single grain to polycrystalline ribbon deformation mode, which is reflected by an abrupt increase in the smoothness of the ribbons. This change is interpreted to represent a strain softening kink in the stress-strain-time path. Progressive ribboning is accompanied by strengthening c-axis fabric Z-maximum indicative of continued plastic flow through basala glide. Operation of basal a glide at these high-temperature conditions (680-700ºC) is interpreted as a consequence of relatively dry deformation conditions. A model is then proposed for development straight quartz ribbons in high-grade striped gneisses, where scattered quartz grains are continuously stretched and segregated by crystal-plastic processes. The small angle misorientation of the contacting grains enables subsequent coalescence and resulting grain size enlargement. Pervasive grain boundary migration accounts for the characteristic straight grain boundaries and rectangular grain shapes commonly