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Temperature constraints on microfabric patterns in quartzofeldsphatic mylonites, Ribeira belt (SE Brazil)

Carolina Cavalcante[a*], Leonardo Lagoeiro[a], Haakon Fossen[b, a], Marcos Egydio-Silva[c], Luiz F.G. Morales[d] Filippe Ferreira[e], Thailli Conte[a]

[a]Department of Geology, Universidade Federal do Paraná, Av. Cel. Francisco Heráclito dos Santos, 100, 81531-980 Curitiba, Brazil
[b]Museum of Natural History/Department of Earth Science, University of Bergen, Allégaten 41, N-5007 Bergen, Norway
[c]Instituto de Geociências, Universidade de São Paulo, Rua do Lago, 562, 05508-080 São Paulo, Brazil
[d]Scientific Center for Optical and Electron Microscopy, ETH Zürich, Auguste-Piccard-Hof 1, 8093 Zürich, Switzerland.
[e]Bayerisches Geoinstitut (BGI), University of Bayreuth, Universitätsstraße 30, 95447 Bayreuth, Germany

[*]Corresponding author (geanecarol@gmail.com, tel: +55 41 98843-0330)

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Abstract

Based on samples from the major high-temperature Três Rios-Além Paraíba-Pádua transpressive shear zone in the Ribeira orogenic belt, Brazil, we discuss the applicability of TitaniQ geothermometry to constrain peak temperature conditions during high-temperature mylonitization of quartzofeldspatic rocks, and explore the microfabrics formed at these conditions. We discuss various aspects of the TitaniQ method and conclude that deformation occurred at temperatures ranging from 612 to 740 ± 20 °C in the studied segment of the shear zone. This high-temperature deformation resulted in relatively large grain size, quartz ribbons and abundant intracrystalline deformation. However, the CPO fabrics are weak, and microstructures suggest that quartz deformation was accommodated by dynamic recrystallization involving grain boundary migration with subsequent grain growth, and later some subgrain rotation during exhumation. We relate the weak fabrics to diffusion processes during or immediately after dynamic recrystallization and dislocation creep, and to the effect of competing slip systems during deformation. In terms of rheology, evidence for Dauphiné twinning in our samples suggest strain softening during mylonitization, and we suggest that such twinning may add to the rheologically weak nature of quartzo-feldspatic portions of hot middle to lower crust.