Geophysical Research Abstracts
Vol. 16, EGU2014-15559, 2014
EGU General Assembly 2014

Mineralogical and textural evidences of melt transfer in a granulite from the Paleoproterozoic Itabuna-Salvador-Curaça belt (Salvador da Bahia, Brazil)

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In pelitic rocks, the effect of melt transfer (loss and/or gain) on phase relations can be successfully predicted via phase equilibrium modeling and more particularly using pseudosections with bulk composition as a variable (e.g. White et al., 2001). One of the most obvious effect of melt loss is the dehydration of the rock that limits further melting and favors the preservation of peak metamorphic assemblage. However, in most cases, melt loss has a limited effect that can be hardly seen mineralogically. Indeed, composition of phases like garnet, cordierite or plagioclase, that are first-order metamorphic phase, will not be affected significantly by melt loss. Therefore, evidences of melt extraction must be evidenced texturally.

The goal of this contribution is to present an example where both mineralogical and textural evidences of melt extraction have been inferred. The studied sample is a pelitic granulite from the Paleoproterozoic Itabuna-Salvador-Curaça belt (Salvador da Bahia, Brazil). It is located in the city of Salvador da Bahia, next to the Farol da Bara. Structurally, it is located in a steeply deeping high strain zone that could have play a major role on the segregation and transfer of melt. The gneissic foliation is marked by a compositional banding with centimer-wide quartzo-feldspathic leucosomes in a garnet-bearing granulite. Leucosomes are almost systematically surrounded by a darker layer that is quartz-undersaturated and enriched in spinel and primatic sillimanite. This silica undersaturation is interpreted as the effect of extreme melt extraction and was modeled using phase diagram section. An interesting feature of the rock is that garnet grain size decreases and the number of garnet grains increases in the melanosome away from the leucosome. Furthermore, the type, amount and shape of inclusions in garnet, chemical composition and zoning in garnet also varies greatly and continuously across the gneissic foliation. Texturally, the presence of former melt consists on thin films along grain boundaries, melt pools that are much more abundant in the silica-undersaturated domain close to the leucosome.