Application of rutile thermometry to quartzite: a new tool in metamorphic studies

R.A. FUMES [1] AND G.L. LUVIZOTTO [1]

[1] Department of Petrology, São Paulo State University,
Av. 24A, 1515, 13506-900, Rio Claro, Brazil.
(rafumes@rc.unesp.br, georgell@rc.unesp.br)

Quartzite represents a poor chemical system and is fairly unreactive when compared to other metamorphic rocks. Thus, it is seldom used in metamorphic studies. Geothermometers based on the equilibrium ZrO_2-TiO_2-SiO_2 might be used to assess temperature in this rock, since Zrn, Rt and Qtz are often present. However, it has been shown [1,2] that quartzite may preserve chemical composition of inherited Rt grains. A set of quartzites interbedded with schists from an area where the metamorphic gradient is oblique to the geological contacts (Lumiárias *Nappe* - Brazil) is used to evaluate the application of Zr-in-Rt thermometry to quartzites. Independent *P-T* data on the metapelite (pseudosections, Zr-in-Rt and Ti-in-Qtz) confirm a metamorphic gradient with conditions increasing from north (550 °C, 1.0 GPa) to south (640 °C, 1.5 GPa). Trace elements of Rt grains (heavy mineral separate, 63-200μm fraction) from seven quartzite samples (ca. 20kg each) that span the whole metamorphic gradient were analyzed by EPMA (JEOL 8230) at the São Paulo State University. In all samples, Nb/Cr in Rt is high and indicates pelitic signature. Zr contents in Rt from the lower-grade portion (< 580 °C) show a large spread. Higher grade samples show a smaller spread (Fig. 1). Other elements, such as Cr and Nb follow the same pattern. A slight increase in Zr content, marking the metamorphic gradient, is observed. Detailed BSE imaging shows that size and shape of Rt do not correlate with its chemical composition. In conclusion, the Zr-in-Rt geothermometer may be applied to quartzites and equilibration occurs at about 580 °C (1.2 GPa), opening new possibilities in metamorphic studies.

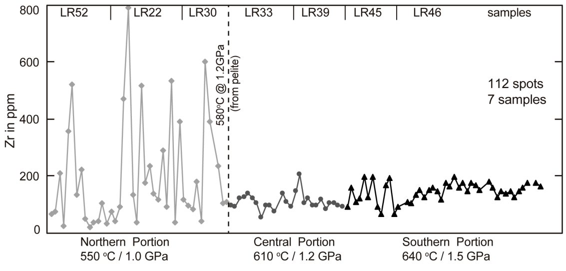

Figure 1: Zr content in rutiles (EPMA). *P-T* data from pelites.

[1] Triebold *et al*. (2007) *Chem. Geol*. **244**, 421-436. [2] Luvizotto *et al*. (2009) Miner. Petrol. **97**, 233-249.