

METASOMATIC EVOLUTION OF BARROCA CHLORITITES, QUADRILÁTERO FERRÍFERO

Queiroga, G.N.¹; Batista, J.P.F.¹; Hartmann, L.A.²; Lana, C.C.¹; Jordt-Evangelista, H.¹; Santos, J.O.S.³; Castro, M.P.¹; Alkmim, A.R.¹

¹Universidade Federal de Ouro Preto; ²Universidade Federal do Rio Grande do Sul; ³University of Western Australia

ABSTRACT: Blackwall alteration is caused by metamorphic reactions assisted by fluids which promote chemical changes in rocks. Blackwall forms in contact zones between rocks of contrasting compositions, such as granite and peridotite, and is constituted predominantly by chlorite, biotite and amphibole. A blackwall chloritite in the Barroca Quarry, Mariana district, Minas Gerais, allows the study of geological and temporal evolution of Quadrilátero Ferrífero. The chlorite-rich metasomatite was formed in the contact between an ultramafic granofels (carbonate-Mg-chlorite-talc) of the Rio das Velhas Supergroup and a tonalite xenolith of the Santa Bárbara Complex. Both petrography and electron microprobe analyses (JEOL JXA-8230) of two chloritite samples (AM-01, AM-02), were performed at the Laboratory of Microscopy and Microanalysis, Universidade Federal de Ouro Preto (DEGEO-UFOP). Sample AM-01 was collected close to the felsic xenolith and AM-02 more distant towards the metaultramafic rock. AM-01 shows decussate microstructure with low-amphibolite-facies Al-rich mineral assemblage of Mg-chlorite + phlogopite + talc ± plagioclase. Subhedral plagioclase crystals are zoned, with Na content increasing toward the rim, probably a remnant mineral from the felsic rock. An alternative is feldspar generation during the metasomatic process with an inherited oligoclase core and a metasomatic rim. AM-02 is also an amphibolite facies chloritite with higher contents of Mg and Ca; mineral assemblage is Mg-hornblende + Mg-chlorite + phlogopite + talc ± plagioclase. Zircon is a common accessory in both samples. U-Pb and Lu-Hf isotopic determinations and trace element chemistry of zircon from both metasomatic rocks were made at the geochronological laboratories of DEGEO-UFOP and University of Western Australia. Grains are anhedral to subhedral, up to 100 µm in size and show hydrothermal influence. AM-01 shows ϵ_{Hf} values between -5.08 and +1.15 while ϵ_{Hf} values for AM-02 range from -6.48 to -4.35, typical of continental crust. The binary diagram U vs. Yb corroborates this continental origin. The U-Pb SHRIMP analyses in non-hydrothermal zircon crystals of both samples showed alignment, with an upper intercept at 2813 ± 6 Ma (AM-01; n = 9, MSWD = 4.0) and 2807 ± 7 Ma (AM-02; n = 9, MSWD = 4.3). The lower intercept is 513 ± 29 Ma (AM-01) and 480 ± 20 Ma (AM-02). The dataset evidences the origin of the blackwall from the Archean tonalite xenolith with the metasomatic contribution of chemical elements from the metaultramafic rock. The lower intercept of the discordia diagram at 480-510 Ma indicates a hydrothermal process in the Cambrian-Ordovician. The hydrothermal pulses provide support for *in situ* (chemical dating) Early Paleozoic U-Pb-Th monazite data that were recently reported for pelitic schists from the upper units of Quadrilátero Ferrífero located east and southeast of Ouro Preto. The metasomatic chloritites are the repository of significant information about the evolution of the Quadrilátero in the Archean (approximately 2810 Ma) and in the Cambrian-Ordovician. Decoding of timing and geological environment can be done by the methods described herein.

KEYWORDS: BLACKWALL, METASOMATISM, MINERAL CHEMISTRY, GEOCHRONOLOGY