

A HYBRID ORIGIN FOR THE CHLORITITE OF THE ARROIO GRANDE OPHIOLITE (SOUTHERNMOST BRAZIL) FROM U-Pb SHRIMP AGES

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ABSTRACT: In the Arroio Grande Ophiolite, located in the Arroio Grande Complex (a portion of the Brazilian extension of the Punta del Este Terrane) in southernmost Neoproterozoic Dom Feliciano Belt, metasomatic rocks are common. These reactions are attributed to the contact between granitoid intrusions of the Pelotas Batholith and chemically contrasting lithologies of the ophiolite, e.g., marbles and mantle-derived Cr-rich serpentinites. In the southern portion of the ophiolite, the serpentinites are surrounded by metasiliciclastic rocks (schists and metagraywackes; detrital zircon ages ranging from 2000 to 600 Ma), both positioned along the Ayrosa Galvão-Aroio Grande Shear Zone, responsible for the regional deformation and the emplacement of the syn-kinematic Três Figueiras Granite (615-585 Ma magmatic age). These serpentinites were transformed in talc schists, tremolitites and chloritites, attributed to reaction zones of, respectively, talcification, tremolitization and chloritization, as the result of Si-metasomatism. Based on the anomalous content of zircons in the chloritites (up to 3 %), together with the proximity with the Três Figueiras Granite, previous studies attributed to the latter the origin of the Si-rich fluids, which interacted with the serpentinite bodies generating the metasomatic zones. In order to test this hypothesis, the present work presents an U-Pb SHRIMP dating of twelve zircons from the chloritite, integrated with a scanning electron microscopy (SEM) study (and standardless semi-quantitative EDS analysis) of one chloritite thin section. The obtained (²⁰⁶Pb/²³⁸U) ages range between 1985 and 585 Ma. The SEM-EDS analysis allowed the refinement of those results: the zircons can be divided in a group of those associated with monazite, and one of those with ilmenite. The zircons with monazite association are found within metasomatic reactions of dissolution and reprecipitation of monazite crystals. These monazites, in turn, were interpreted as xenocrysts derived from the monazite-rich Três Figueiras Granite, due to their identical mineral composition (all concentrations in wt%: 0.5 CaO, 30 Ce₂O₃, 15 La₂O₃, 12 Nd₂O₃, 30 P₂O₅, 0.5 SiO₂, 4 ThO₂). As such, the ages of 620 and 585 Ma (within the age spectrum of the granite) were associated to these monazite-related zircons. The zircons with ilmenite association are found as inclusions within or near large ilmenite grains. Both ilmenite and zircon were interpreted as detrital in origin, since identical features can be observed in the metasiliciclastic rocks which surround the chloritite outcrops. Therefore, the ages ranging from 1985 to 667 Ma are compatible to the published ages for the metasiliciclastic rocks of the Arroio Grande Complex, and the detrital origin explains the wide radiometric age range of the chloritite. From those relationships we interpret the chloritite as a hybrid blackwall reaction zone, resulting from the interaction between a former serpentinite body (the protolith of the chloritite) and the surrounding metasiliciclastic rocks, together with fluids derived from the emplacement of the Três Figueiras Granite.

KEYWORDS: GEOCHRONOLOGY, METASOMATISM, SERPENTINITES.