

## GARNET ZONATION AND MONAZITE AGES AS MONITORS OF CONTRASTING METAMORPHIC EVOLUTION IN THE BRASILIANO SCHIST BELTS OF SOUTHERN BRAZIL

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**RESUMO:** Garnet zonation patterns are combined with monazite ages to better elucidate the metamorphic evolution of rocks from the southern Brazilian metamorphic belts. This evolution is remarkably distinct for each individual belt and closely related to the baric type of metamorphism. Brasiliano metamorphic schist belts in the Rio Grande do Sul Shield have similar NE-trends but distinct evolutionary metamorphic patterns. The eastern Porongos metamorphic belt with two sub-parallel arms (East and West) consists of metapsammitic, metapelitic and calcareous rocks as well as Paleoproterozoic gneisses exposed in the western arm. In the central part of the shield, outcrops of the Passo Feio belt show mainly metapelitic, and minor metapsammitic, calcareous and metabasic rocks as well as the syn-tectonic Caçapava granite intrusion. To the west in the Cambaizinho belt the petro-tectonic associations are dominated by mafic-ultramafic rocks with minor metapelitic and metapsammitic sequences. Previous work has shown that the western arm of the Porongos belt, with kyanite and sillimanite in metasediments, is a medium-pressure (barrovian type) belt whereas the Passo Feio belt is a low-pressure metamorphic belt. The Cambaizinho belt to the west has experienced intermediate pressure conditions. Compositional X-ray maps of garnet of both belts, Porongos and Passo Feio, show contrasting patterns. Garnets from Passo Feio metapelites, collected in the staurolite zone, have a remarkable concentric compositional zoning whereas garnets from metapelitic rocks of the sillimanite zone of the Porongos belt show irregular zoning. Passo Feio garnets are characterized by high concentrations of MnO and CaO and low concentrations of MgO and FeO in the core. The Mn and Ca contents decrease dramatically towards the rim. Also the inclusion minerals (quartz and ilmenite) are very small in the core but increase in size towards the rim. The observed concentric and regular bell-shaped zonation pattern of garnet is related to temperature increase which identifies prograde metamorphism in the Passo Feio belt. In contrast to that, the garnets from the Porongos belt do not show a concentric zonation. Also, the inclusion suites do not show any discernible pattern. Instead, Porongos garnet present an irregular and chaotic compositional zoning which indicates resorption due to mineral reaction with neighboring minerals. This particular garnet pattern is related to recurrent metamorphic/deformational events. Monazite ages, obtained by laser ablation ICPMS technique from the studied schists, show two main metamorphic events. Passo Feio monazite yielded ages between 620-650 Ma whereas Porongos monazite ages are between ~620 and 740 Ma. The combination of monazite ages and garnet zonation patterns indicates that the progressive metamorphism in the Passo Feio belt began at 650 Ma and finished at ca. 620 Ma. Thus, the orogenic collisional event lasted ca. 30 Ma. The Porongos belt shows a more complex and longer history with the first event M1 at ca. 740 Ma and the second M2 around 620 Ma. Furthermore, the distinct garnet patterns of both study areas constitute an obvious signature for each belt and are, thus, useful tools to be used in provenance studies where the heavy mineral assemblages of sandstones are well preserved.

**PALAVRAS-CHAVE:** GARNET ZONING; MONAZITE AGES; PROVENANCE.