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Monazite U-Th-Pb petrochronology of the Cu-Ni mineralized mafic-ultramafic intrusions/bodies in the N5 and N7 Cu-deposits of the Vermelhos system, Curaçá Valley, Brazil.

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The Curaçá Valley district in the Itabuna-Salvador-Curaçá orogenic belt of the São Francisco craton, Brazil, hosts several Cu(-Ni) sulfide deposits within mafic-ultramafic complexes intruding Archean and Paleoproterozoic gneisses. The deposits genesis is debatable and the timing of magmatism and mineralization in the district remains poorly constrained. This study presents the first in situ microprobe U-Th-Pb monazite petrochronology from Cu-Ni sulfide mineralized mafic-ultramafic intrusions and a plagioclase-rich pegmatoid rock in the N5 and N7 Cu-deposits of the Vermelhos system.

Copper-Ni mineralization in N5 and N7 is mainly comprised of chalcopyrite ± pyrrhotite–pentlandite (Cu/Ni: 0.07-35) within sulfide breccias and disseminated to patchy sulfides hosted by orthopyroxenite–norite–phlogopitite (>50% phlogopite) intrusions. Pegmatoid hosting disseminated/patchy chalcopyrite locally occur in adjacent areas to the previous units, and all of these units cross-cut gneissic fabrics.

Monazite is a common accessory mineral in the mineralized intrusions/bodies of N5 and N7. Within studied mineralized orthopyroxenite, sulfide breccia, and pegmatoid, monazite inclusions occur within primary silicates, apatite and sulfides variably associated with secondary serpentine/talc, chlorite, epidote, actinolite, calcite, chalcopyrite, and thorite. These monazites exhibited complex variations in sizes, zoning, fractures, porosity, resorbed areas, and compositions, with individual ages ranging from 2054 ± 68 to 1833 ± 67 Ma in homogeneous domains, and 1868 ± 68 Ma to 1449 ± 62 Ma in heterogeneous/altered domains.

Isochron regression ages from homogeneous and heterogeneous monazite domains within primary and secondary minerals defined two broadly similar populations in the different rock types: i) older ages from 1944 ± 20 Ma (orthopyroxenite-breccia) and 1917 ± 16 Ma (pegmatoid) in homogeneous domains included in primary and secondary phases, which are interpreted to be related to magmatism and mineralization; ii) younger ages of 1847 ± 16 Ma (orthopyroxenite-breccia) and 1789 ± 13 Ma (pegmatoid) within heterogenous domains associated to secondary minerals, which are likely associated with hydrothermal activity and localized sulfide remobilization.

These results are consistent with the magma/mineralization emplacement after the major deformation event in the orogenic belt, contradicting previous models that proposed that the mineralization was metamorphosed and deformed.