WATER-FLUXED MELTING OF THE CAMBORIÚ COMPLEX, SOUTHERN BRAZIL: STRUCTURAL CONTROL, MICROSTRUCTURES AND MELT-PRODUCING REACTIONS

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The Camboriú Complex (CC) in the region of Camboriú-Itapema (southern Brazil) comprises ortho- and para-metamorphic rocks as well as magmatic rocks. The metamorphic rocks show widespread evidence of structurally controlled partial melting of all rock types at upper amphibolite facies conditions, with the generation, accumulation, and migration of large volumes of neosome (leucosome + residue). The protoliths of these migmatites comprise thinly-laminated gneisses of tonalitic to granodioritic composition, commonly interleaved with amphibolite bandsand subordinate calc-silicate rocks and pelitic gneisses. Metamorphic banding dips gently SE or NW defining symmetrical, double-plunging, upright folds, mostly with SW shallow-plunging axis, in a wide range of scales (cm to tens of m). Melting begins along the mm-thick banding, migrating into cm-thick syn-magmatic shear zones subparallel to the axial plane of folds, locally evolving to meter-thick, subvertical leucogranite dikes, interpreted as channels of magma mobilized from the migmatites. At the micro-scale, corroded grains of biotite and hornblende, and rounded crystals of feldspars inside large quartz crystals suggest that these minerals were reactant phases during migmatization, while well-formed crystals of titanite and hornblende inside cuspate-shaped quartz grains are interpreted as peritectic phases (solid products of melt reactions).Based on mineralogy and microstructures three main reactions are proposed: (1) Qz + Pl ± Kfs + Bt + H_2O = Ttn + melt; (2) Qz + Pl + Hbl + H_2O = Hbl + melt; and (3) Qz + Pl ± Kfs + Bt + Hbl + H_2O = Ttn + Hbl + melt. Reactions consuming biotite tend to form Kfs-rich melts and peritectic titanite, while the reactions that consume hornblende tend to form Pl-rich melts and peritectic hornblende. Where both biotite and hornblende are consumed, melts show similar amounts of Kfs and Pl and crystallize peritectic hornblende and titanite. Peritectic hornblende requires at least 2% of H_2O to crystallize, and formation of Al-bearing titanite, suggest high H_2O activity. The Hbl-Pl geothermobarometer was used in order to obtain temperature and pressure during migmatization. Estimated temperatures range between 703 and 744°C and pressures between 3.4 and 4.2 kbar. The widespread melting features in all rock types, large volumes of leucosome associated with relatively low temperature and the nature of the peritectic phases suggest that melting of the Camboriú Complex occurred in the presence of free water (water-fluxed melting). The structural control of the melting process and migration related with symmetrical folding and transposition by syn-magmatic shear zones and dykes points to an interplay of melting and deformational processes which probably assisted exhumation of the complex during the post-collisional stage of the Brasiliano / Pan-African Cycle.

KEYWORDS: WATER-FLUXED MELTING, STRUCTURAL CONTROL, MELTING REACTIONS