Magmatic Evolution of Northern Borborema Province

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The magmatic evolution in the northern Borborema Province (NBP) is related to West Gondwana amalgamation and reflects part of the closure of the Pharusian paleocean, subduction of oceanic lithosphere, continental collision (Amazonia, São Luiz-W. Africa, São Francisco-Congo), and post-orogenic magmatism. This evolution is summarized in five magmatic stages, which are interrelated with the development of the structural-tectonic fabric. Santa Quitéria Magmatic Stage (SQMS) (658-606 Ma) is pre- to syn- thrust and comprises three magmatic units, all sliced, displaced and deformed by thrust fault: (i) felsic unit represented by high-K calc-alkaline and shoshonite megaporphyritic monzogranites of metaluminous and magnesian affinity, associated to dioritic enclaves of shoshonite and ultrapotassic series; (ii) intermediate unit of equigranular, melanocratic monzodiorites to monzogranite with clinopiroxene and hornblende, which is genetically correlated with the felsic unit; the main textural feature corresponds to gabbro-diorite micro enclaves of shoshonite series; (iii) mafic unit consists of gabbroic enclaves sparsely found along the Santa Quitéria Batholith (SQB) and the mafic complex of Malhada Grande, which is composed of olivine gabbro affected by sub solidus metamorphism at granulite facies. The origin of this complex is related to slab tearing and rise of the asthenosphere. Tamboril Magmatic Stage (TMS) is late thrust to syn transcurrence and comprises two units: an epizonal equigranular pink granitic unit of high-K calc-alkaline and shoshonite series of ferroan affinity and an injection migmatite unit whose morphologies are controlled by structure and composition of host rock, the distance of intrusive suite and the number of successive injections. The TMS transgress the limits of SQB and affects the Archean and Paleoproterozoic basement. The magmatic evolution proceeds with Quixeramobim Magmatic Stage (QMS), Seridó Magmatic Stage (SMS) and Final Bimodal Magmatic Stage (FBMS). QMS is controlled by the onset (ca. 580 Ma) and reactivation (ca. 530 Ma) of transcurrent shear zones. SMS (ca. 520 Ma) corresponds to residual pegmatite magmatism and metassomatic process associated to hydrothermal and pneumatolytic alteration, which culminated in the transformation of gabbro to calc-silicate rocks and mineralization in a devolatized thickened continental crust. FBMS (ca. 470 Ma) represents the plutono-volcanic, bimodal, high temperature magmatism related to caldera volcanoes, ring complex and subvolcanic dyke swarms on extensional environment on the cratonic lithosphere, which is temporally associated with deposition of the first sediments of the Parnaíba Basin. Nd isotopic data indicate that the genesis of SQMS and TMS corresponds to a mixture of a juvenile mantle component and older crustal rocks during a process of mantle crust interaction. SMS and FBMS show isotopic overlapping with surround basement rocks, suggesting intracrustal melting with less mantle incursions. Nd data for Archean to Ordovician rocks of NBP reflect the evolution of continental crust and show a systematic change of isotopic characteristics at successively younger crustal segments, which must reflect the irreversible progressive mantle fractionation and the increasing diversity and complexity of the crustal component trough time.

PALAVRAS CHAVE: West Gondwana Amalgamation, Brasiliano Orogeny, High-K and Shoshonite Magmatism.