

PETROLOGY AND TECTONIC SETTINGS OF THE UMBU KIMBERLITE, SERRINHA BLOCK, SÃO FRANCISCO CRATON, BRAZIL

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ABSTRACT: Large-scale diamond exploration based on groundmagnetics geophysics and follow-up kimberlite indicator minerals during early 1990s, culminated in the discovery of the Umbu Kimberlite. The kimberlite body is located in the northeast part of São Francisco Craton, in the Archean Serrinha Block, and forms part of a restricted Neoproterozoic kimberlitic magmatism in the northern Brazilian Shield, represented by the Brauna Field, Aroeira, Rio do Peixe, Incó 01 and 02, Asa Branca 01 and 02, Angico and Alecrim kimberlites. The Umbu kimberlite exhibits a strong groundmagnetic anomaly, and it is interpreted to be a small sub-vertical dyke, oriented N10W-trending, intruding by sharp contact the central sector of the Paleoproterozoic Nordesteina granodiorite batholith, that makes part of the sin-collisional tonalite–trondhjemite–granodiorite suite of the Rio Itapicuru Greenstone belt. The contact with the host rock is fenitized, or kimberlitised, and few wall-rock xenoliths are present into the rock matrix. The Umbu kimberlite is diamondiferous, indicated by the treatment of small-volume of saprolitic samples that returned 0.078 carats of microdiamonds (< 0.001 to 0.1 carats). The kimberlite groundmass does not exhibit fragmented or explosive structures (e.g. pelletal lapilli), whereas an igneous texture formed by a hot, volatile-rich kimberlitic magma is identified. Hypabyssal facies is dominant and field relationships indicate an eroded deep root zone tectonic environment. The kimberlite exhibits macrocrystic texture dominantly inequigranular porphyritic. Modal analysis of the mineral phases including macrocrysts comprises phlogopite (65%), olivine (25%), serpentine (5%), calcite (3%), piropo garnet (1%), perovskite (< 1%), anatase (< 1%), apatite (< 1%), spinel (<1%); ilmenite (<1%). Umbu kimberlite is iron-rich ($\text{Fe}_2\text{O}_3 = 8.13$ wt.%) with $\text{Mg\#} = 86.27$ and has geochemical transitional between South African orangeites (high $\text{SiO}_2/\text{Al}_2\text{O}_3 = 14.23$ and $\text{MgO}/\text{CaO} = 11.27$; low $\text{P}_2\text{O}_5 = 0.68$ wt. % and $\text{CaO} = 2.01$ wt. %), and South African kimberlites ($\text{K}_2\text{O}/\text{TiO}_2 = 0.31$). Major elements patterns suggest low degree of partial melt and/or a moderate refractory enriched source at up to 5 GPa. Considering the mineral composition, whole rock geochemistry similarity and field relationship, Umbu kimberlite can be an extension of the transitional or anomalous type 642Ma Brauna Kimberlite Field, and or makes part of the same Neoproterozoic kimberlitic event related to the break-up of the Rodinia supercontinent in the northeast part of the São Francisco craton.

KEYWORDS: SÃO FRANCISCO CRATON, KIMBERLITE, TECTONIC SETTINGS, PETROLOGY.