

SAND INJECTITES FROM THE NOVO HAMBURGO COMPLEX, PARANÁ VOLCANIC PROVINCE

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RESUMO: Sand Injectites present in the lavas of Serra Geral Group show evidence of rise of sandy sediments underlying the volcanic package. The sand was fluidised and transported toward the surface as a result of hydrothermal processes that occurred in the basin and generated structures such as dikes and sandstone sills, basaltic breccias with sandstone and sand flows, which were covered by new lava flows. The sandstone has a high degree of silicification in these structures, which contrasts sharply with the very friable sandstone of the Botucatu Formation. Occurrences of these injectites are intense throughout the Paraná Basin, including the mining districts of Ametista do Sul and Quaraí (Brazil) and Los Catalanes (Uruguay), which are precursors of agate and amethyst mineralization. Previous research carried out in quarries in the metropolitan area of Porto Alegre, Torres/RS, Serra Maracaju/MS, Realeza/PR and Botucatu/SP revealed essential features of sand injectites. Tapered sandstone dikes were observed feeding the sandstone sills, both intensely silicified. A sandstone layer reached the paleosurface in places and formed a sand flow, which has horizontal and locally low angle stratification. This layer is now overlapped by another basalt flow, indicating that the hydrothermal processes were intercalated with volcanic flows. Phreatic breccias are common associated with sandstone dikes. Clasts of angular basaltic rock, immersed in a sandy matrix cemented by silica, do not show quenched rims, showing a low temperature contact of the fluid with the wall rock. We established the relative age between injections of sandstones and filling of cavities of igneous rock. The sands cut the filled cavities containing zeolites and silica, often replacing the filling. The sandstone flows mark the magmatic activity intervals, serving as a stratigraphic guide for the volcanic flows. Four pairs of samples (friable sandstone/sand injectite) were collected, totaling 85 zircons per sample for dating by SHRIMP U-Pb method. The analyses were obtained in the USP/SP and Curtin University/Australia laboratories. The U-Pb zircon ages show four main peaks: Sunsás (1155-962 Ma), Brasileiro (808-530 Ma), Cambro-Ordovician (505-448 Ma) and Permian (296-250 Ma). There are also two small concentrations of ages in the Archean (3.8-2.5 Ga) and Paleoproterozoic (2.5-1.6 Ga). Zircon age peaks indicate that each orogeny is related to several pulses of igneous activities in southern South America. The combined action of three major geological events made it possible to modify the extrusive rocks and subsequently inject the sand, and these are the large continental province of little deformed basalt, a large active erg and the huge Guarani aquifer with an infinite amount of available hot water.

PALAVRAS-CHAVE: SAND INJECTITES, SERRA GERAL GROUP, SHRIMP.