51º CONGRESSO BRASILEIRO DE

GEOLOGIA

13 A 17 DE OUTUBRO DE 2024

BELO HORIZONTE - MG

Centerminas Expo

ANAIS

ID do trabalho: 1587

Área Técnica do trabalho: TEMA 19 - Magmatismo e Processos Petrogenéticos

Título do Trabalho: Kimberlitic olivines deciphering mantle source heterogeneities at the Alto Paranaíba Igneous Province, Brazil

Forma de apresentação: Oral

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Resumo do trabalho:

The Alto Paranaiba Igneous Province (APIP; Upper Cretaceous, Brazil) groups ultrabasic to ultrapotassic bodies intrusive at the borders of São Francisco Craton and the adjoining Brasilia Mobile belt. Intrusions of kimberlite affinity are one of the main focus of this area, due to the possible correlation of these bodies with adjoining diamond fields. In the studied occurrences of APIP (Pântano, Catalão 1b, Três-Ranchos-55 and Três Ranchos-4), olivine is the main phase and occurs as mega-, macro- and microcrysts dispersed in the groundmass, with subordinate occurrence within mantle peridotite xenoliths. Major, minor and trace elements on olivines were determined by electron microprobe and LA-ICP-MS at USP and UAlberta, respectively. Mostly, the olivine core compositions define a main mantle trend characterized by Fo90-93, with very low CaO (< 0.12 wt%), and narrow range and high values of NiO (0.32-0.46 wt%). These compositions are similar to those found for olivine grains in peridotite xenoliths of APIP as well as the worldwide mantle compositions, being representative of mantle xenocrysts derived from the desegregation of mantle xenoliths during magma ascent. The concentration of minor and trace elements (Ni, Cr, Mn, Ca, Ti, Al, Sc, Zr) of olivine mantle xenocrystic cores from APIP (Fo> 90) indicates that they represent several levels of the mantle stratigraphy. Using trace elements discrimination plots, the studied intrusions present xenocrystic cores derived from garnet peridotites to spinel peridotites. However, metasomatic signatures are recorded by cryptic variations in some olivine crystals. The Ti and Ca progressive enrichment of the olivine xenocrystic cores are indicative of a metasomatic trend, compatible to those found in kimberlite and ultramafic melts from other cratonic areas worldwide. The decrease of V/Sc ratios of these crystals points toward more oxidized environment, compatible with a metasomatic origin from the reduced cratonic composition. Overgrowth and rim values define a main melt trend characterized by a decrease in NiO (0.09-0.046 wt%) and an increase in CaO (0-0.48 wt.%) concentrations at a restricted range of Fo84-86. The buffered Mg# of the olivine crystals from the melt trend is attributed to reactions of the kimberlitic melt with more SiO2-saturated crystals during kimberlite evolution, specially pyroxenes. The melt trends from APIP olivines can be assigned to crystallization in conditions close to equilibrium with ultramafic melts from carbonated peridotite source. Olivine overgrowth and rim compositions present lower Ni/Mg than those from a pyroxenite-derived melting experiments, lower Ca/Fe and Mn/Fe ratios compared to olivines from a peridotite-derived melting experiments and lower Ca/Fe and high Ni/Mg than olivines from phlogopite-rich vein plus peridotite melting experiments. The APIP cognate olivines have intermediate values of Ni/Mg, Ca/Fe and Mn/Fe ratios, placed between those from carbonated peridotite and peridotite-derived experimental melts. The origin of kimberlitic melts is attributed to hybridization between a protokimberlitic carbonatite/carbonate-rich melts and the lithospheric mantle. Acknowledgements: Grants from FAPESP (Procs. 2019/22084-8; 2023/11675-0), and CNPq (404020/2021-6, 310055/2021-0).

Palavras-Chave do trabalho: kimberlites; mantle xenocrysts; olivine; trace elements;