

Metasomatized mantle xenoliths from Canastra-1 kimberlite, southern edge of the São Francisco Craton

LUISA GOMES BRAGA¹, TIAGO JALOWITZKI¹,
MARCELO PERES ROCHA¹, FERNANDA GERVASONI²,
MAURIZIO MAZZUCHELLI³, TOMMASO
GIOVANARDI³, EDUARDO NOVAIS RODRIGUES¹,
MARINA DALLA COSTA⁴, REINHARDT ADOLFO FUCH¹,
GEORGINA MARIANELA RUBIANO⁵, GUSTAVO
WALTER BERTOTTO⁵ AND ROBERTO VENTURA
SANTOS¹

¹Universidade de Brasília (UnB)

²Universidade Federal de Goiás (UFG)

³Università degli Studi di Modena e Reggio Emilia

⁴Agência Nacional de Mineração

⁵CONICET - Universidad Nacional de La Pampa

Presenting Author: luisagbraga@gmail.com

The diamond-bearing Canastra-1 kimberlite represents a Cretaceous intrusion that belongs to the Alto Paranaíba Igneous Province (APIP), Brazil. This kimberlite hosts mantle xenoliths including garnet-bearing lherzolites, websterites (two samples are amphibole-bearing), clinopyroxenites and one eclogite. Magnesium number (Mg#) of lherzolitic olivine (88-91), orthopyroxene (90-92) and clinopyroxene (89-91) are typical of mantle origin. Minerals from the hydrated websterites contain lower Mg# (opx = 74-75; cpx = 78-79) than the anhydrous ones (opx = 90; cpx = 89), indicating a cumulate origin for these samples. The clinopyroxene Mg# of clinopyroxenites is low (86-87), except for one sample that contains high Mg# (90). The Mg# of eclogite omphacite is 87. Clinopyroxenes of the hydrated websterites show high CaO (>21 wt.%) and Al₂O₃ (>5 wt.%) contents coupled with low MgO (<14 wt.%), defining a trend in which CaO and Al₂O₃ contents decrease and MgO increase, characteristic of partial melting process. Pyrope endmember in garnets decreases from lherzolite (71-76) to anhydrous websterite (70-72), clinopyroxenite (62-69), eclogite (57) and hydrated websterite (42-46). The rare earth element (REE) patterns of clinopyroxenes display variable enrichment in light-REE (LREE) related to heavy-REE (HREE) (Ce/Yb_N = 9.1-60.9), which indicate cryptic metasomatism. Garnets show normal REE pattern characterized by the domain of high HREE and gentle decrease of LREE (Ce/Yb_N <0.32). Representative temperature (T) and pressure (P) estimates demonstrate that lherzolites, anhydrous websterites and clinopyroxenites represent the deepest mantle column of Canastra-1 lithosphere (T = 1262-1338 °C; P = 5.0-5.5 GPa), whereas hydrous websterites (T = 887-926 °C; P = 2.7-3.3 GPa) and eclogite (T = 972 °C; P = 4.4 GPa) samples are shallower. Therefore, we propose that cryptic metasomatism recorded by the lithospheric mantle beneath Canastra-1 occurred due to the collision between the São Francisco Craton and the Paranapanema Block during the Neoproterozoic. The low-velocity anomaly observed in the seismic tomographic data corroborates the high temperature estimates observed in the

deeper xenoliths and it might be related to the lithospheric thinning and consequent asthenosphere upwelling in the Brasília Mobile Belt or could be associated to a Cretaceous fossil plume.