

## **GEOLOGICAL, GEOCHEMICAL AND PETROLOGICAL STUDIES OF A DIAMONDIFEROUS KIMBERLITE (B1) FROM BRAHMANAPALLE CLUSTER, WAJRAKARUR-KIMBERLITE FIELD, SOUTHERN INDIA**

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### **Abstract**

A first report on field geology, petrography and whole rock geochemistry of the Brahmanapalle kimberlite (B1) pipe, discovered by the Rio Tinto Exploration during the years 2003-2004 is presented. The pipe is emplaced into Closepet granitoids and gneisses of Archaean age forming a part of the Eastern Dharwar Craton (EDC). The pipe is exposed in the field as a calcrete breccia, crosscut by numerous crystalline calcite veins. The rock displays inequigranular texture with predominance of olivine macrocrysts ranging from microscopic level to 2 cm diameter with a minor suite of pyroxenes, phlogopite, calcite and ilmenite. Textural variations such as the presence of two generations of olivine, variable macrocryst size, xenocryst content and xenolith proportion suggest that the kimberlite was formed during multiple pulses. The kimberlite indicator mineral (KIM's) assemblage collected from the kimberlite and calcrete includes pyrope, Cr-diopside, ilmenite and chromite. Calcrete petrography of this pipe displays relict olivine pseudomorphs and kimberlitic textures. The geochemical modelling confirms archetypal Group-I nature of the B1 pipe. The kimberlite magmatism had originated under low degree of partial melting (0.1 to 0.5 %) from a garnet lherzolite source with enriched LREE and depleted HREE content. The La/Yb whole-rock values (160) indicate a fractionated parental melt. The diamondiferous nature of the B1 kimberlite is supported by whole rock geochemistry and the discovery of a dodecahedral microdiamond (~1.5 mm) crystal. An overall geochemical and petrological examination confirms its deep mantle origin, sampling the 'diamond window' and its potential prospective character.

*Keywords:* Kimberlite, B1, Group-I, microdiamond, diamond prospectivity, Wajrakarur Kimberlite Field, Eastern Dharwar Craton.