**NAME OF THE THEME: Earth, Ocean, Atmospheric & Environmental Sciences**

# Context for Diamond Exploration in Telangana state through a holistic petrological appraisal of Kimberlite Clan Rocks (KCR)

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**Abstract:** The Telangana state constitutes a part of eastern Dharwar craton forming a congenial geotectonic domain for emplacement of mantle derived intrusive kimberlite clan rocks (KCR) such as kimberlites, lamproites and lamprophyres. These rocks provide a synopsis of sub-continental lithospheric mantle beneath the surface and act as representatives to present mantle processes and conditions. Moreover, these rocks act as carriers for the king of gemstones, diamond. With the aid latest technology and intervention of national and multinational companies, >60 kimberlites, >20 lamproites and >10 lamprophyres have been discovered to date, by the Geological Survey of India (GSI) and other organisations, in the state. The kimberlites mainly occur as clusters grouped under Narayanpet Kimberlite Field (Mahbubnagar dt.). Lamproites are mainly found as swarms of dykes in different clusters christened as Ramadugu Lamproite Field, Vattikodu Lamproite Field in erstwhile Nalgonda district. Of late, a new discovery called Somasila Lamproite Field was made by the GSI spread in both Archaean granites and lower Cuddapah sedimentaries in Mahbubnagar district. In addition, few solitary occurrences of lamproites are also reported at Gudrapalli, Marepalli and Chintapalli in Mahbubnagar- Nalgonda tract. Lamprophyre dykes occur at Polayapalli, Tirthala, Bayyaram (Khammam dt.) and Kalwakurthy (Mahbubnagar dt.). Petrographically kimberlites exhibit inequigranular textures with dominance of olivine macrocrysts, ilmenite, diopside phenocrysts, olivine pseudomorphs within a groundmass of similar mineral assemblage. Lamproites are predominantly composed of olivine and serpentine pseudomorphs, phlogopite phenocrysts within a fine-grained matrix of similar mineralogy. The lamprophyres exhibit porphyritic- panidiomorphic texture composed of amphiboles, pyroxene, plagioclase phenocrysts. The kimberlites are silica undersaturated ($SiO_2$: 30.1-40.27 wt%), magnesia rich (MgO: 21-29.7 wt%), calcic (CaO: 6.5-13.01 wt%) with $K_2O/Na_2O$ ratio >1.27 wt%) and high Mg# (>70) typical of mafic-ultramafic and highly potassic rocks. The lamproites are silica undersaturated ($SiO_2$: 35-40 wt%), magnesia rich (MgO: 18-20 wt%), calcic (CaO: 8.3-14.05 wt%) with $K_2O/ Na_2O$ ratio >1.2 wt%) and high Mg# (>70). The lamprophyres are slightly rich in silica ($SiO_2$: 46-53 wt%), magnesia (MgO: 7.1-7.97 wt%), calcic (CaO: 9.8-10.85 wt%) with $K_2O/ Na_2O$ ratio (6.8-9.1 wt%) and high Mg# (>65). The concentration of trace elements like Nb, Ni, Cr, La, Ba, Zr is very high in all three types of rocks. The high proportion of LREE and low HREE of these rocks reflects fractionation at the mantle source. The lamprophyres are in general are depleted in Hf, Th with a negative Eu anomaly. The KCRs are derived as a result of inferior degree of partial melting (0.5 to 2%). While kimberlites and lamproites reflect intraplate tectonic conditions, emplacement of calc-alkaline type lamprophyres demonstrates a subduction related regime. As per the current knowledge, all KCR occurrences in Telangana are non-diamondiferous; however, they manifest alkaline magmatism in this part of the Indian sub-continent. Although the KCRs of Telangana are characterized by inferior oxygen fugacity ($fO_2$) similar to Wajrakarur diamondiferous pipes (Anantapur district, Andhra Pradesh), mantle source region factors such as low olivine content, limited volatile content and subsequent rate of ascent of

the magma might have played a significant role in affecting the diamond content of these intrusions. As a whole, the occurrence of KCRs in Telangana state demonstrates a large regional framework of mantle magmatism both in areas where Archaean and Proterozoic rocks are distributed. Nevertheless, as these rocks occur as clusters, they encourage geoscientists to endure exploration further not only to discover many more such findings to enhance the knowledge base on mantle-lithospheric interactions underneath this region but also to locate diamondiferous occurrences in the state.

***Keywords**: kimberlite, lamproite, lamprophyre, KCR, diamond exploration, EDC, Telangana*