

# **Sulphide-saturation history and source heterogeneity of the mafic sills from the Vempalle Formation, Cuddapah basin, Eastern Dharwar Craton, India**

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Platinum Group Elements (PGEs) are the ideal proxies for fingerprinting the geochemical and geodynamic evolution of the mantle. This study documents the platinum group elements (PGE) geochemistry of mafic sills from the Vempalle Formation of the Proterozoic Cuddapah basin. The studied samples have a wide range of PGE contents ( $\Sigma$ PGE ranging from 19.01 to 206.26 ppb), with Ir (0.26–0.48 ppb), Pd, (12.21–175.94 ppb), Ru (1.12–1.87 ppb), Rh (0.65–6.57 ppb) and Pt (4.25–21.03 ppb). PGE geochemistry of the Vempalle sills reveal early sulphur-saturated nature of magmas with pronounced sulphide fractionation and PPGE enrichment over IPGE reflecting the role of a metasomatized lithospheric mantle during their emplacement. Geochemically, Vempalle sills are mostly tholeiitic with low Mg# (32–38), MgO (6.34–8.52 wt%), Zr (91–186 ppm) and Nb/Th (1.3–2.1), exhibiting highly evolved nature which is attributed to fractional crystallisation and crustal contamination. They display pronounced LREE/HREE fractionation  $(La/Yb)_N = 2.68\text{--}5.17$  with feeble negative Eu anomalies  $(Eu/Eu^* = 0.81\text{--}0.95)$  reflecting the role of crustal contamination and plagioclase fractionation. Negative K, Sr and Ti anomalies corroborate an intracontinental, riftogenic tectonic regime for the genesis of the Vempalle sills. REE ratio relationships  $(La/Yb \text{ vs } Dy/Yb; La/Sm \text{ vs } Sm/Yb)$  suggests polybaric partial melting from garnet-spinel lherzolite melting regime in an intracratonic rift setting.

**Keywords:** Platinum Group Elements, mafic sills, Cuddapah basin, sulphide fractionation, intracontinental rift setting.