

Geochemical and rock magnetic characteristics of various colored bole horizons, Deccan volcanic province, India

PRIYESHU SRIVASTAVA^{1*}, N. SIVA SIDDAIAH¹ AND S.J. SANGODE²

¹ School of Environmental Sciences, Jawaharlal Nehru University, New Delhi – 110 067, India
(*correspondence: priyeshusrivastava@gmail.com),
(nssiddaiah@gmail.com)

² Department of Geology, Savitribai Phule Pune University, Pune – 411 007, India (sangode@rediffmail.com)

Boles occurring as paleoweathering surfaces between two successive lava flows are markers of hiatus in Deccan flood volcanism encompassing Cretaceous-Paleogene boundary. Boles show different color characteristics with red being most common and green the rarest. We studied four different color boles i.e. dark red (10R-3/6), light red (10R-4/8), brown (5YR-4/4) and green (5G-6/2) for their mineralogy (XRD and FTIR spectroscopy), geochemistry (major and trace elements including REE) and rock magnetic characteristics to understand paleoweathering and paleoenvironment. The XRD and FTIR spectra of basalt and boles (bulk and clay separates) indicate smectite (montmorillonite) as dominant clay mineral in all the boles formed by weathering of plagioclase in parent basalts. XRD and FTIR data also show presence of hematite in red boles and nontronite and celadonite in green bole. The chemical index of alteration (CIA) ranges from 70 to 80 % for red and brown boles indicating moderate weathering, whereas green bole shows CIA ~60 % suggesting least weathered amongst all boles. The higher SiO₂ in green bole (~55.1 wt.%) compared to the parent basalt (49.14 wt.%) indicates an external source of enrichment i.e. pyroclastic material (volcanic ash). Trace and REE elements show an overall depleted concentration in green bole compared to red and brown boles. Green and light red boles show negative Ce anomaly which has been denoted to acidic environment of genesis. Minimum magnetic susceptibility and maximum hard isothermal remanent magnetization for dark red bole indicate that heating from upper lava flow has completely oxidized ferrimagnetic mineral (titanomagnetite) into antiferromagnetic mineral (hematite). The overall decreased concentration of magnetic minerals in green bole is possibly due to dissolution from acidic rainfall. Therefore, various color boles occurring as paleoweathering surfaces indicate different oxidizing and reducing paleoenvironmental conditions of genesis during Deccan flood volcanism.