

Mineralogical and metamorphic evolution of the Proterozoic mafic magmatic rocks of the basal Aravalli sequence, Rajasthan, India

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Field, mineralogical and geochemical data for metavolcanic rocks of the Aravalli sequence (Aravalli Craton) in Rajasthan, NW India, have been presented. Due to the field research pillow lava structures, indicating their eruption in a marine environment, have been discovered. Primary mineralogy has shown complete alteration during post-magmatic processes associated with the greenschist to lower amphibolite facies metamorphism. The Ti and Al content of Ca amphiboles are in positive correlation with temperature and pressure. Combined isopleths have shown temperature not exceeding of 550°C, for the pressure in range 1.5- 2.5 GPa. The spinifex-like texture of the pillow-lava surface evidenced fast quenching conditions. Primary mineralogy have been then overprinted by plagioclase–chlorite–amphibole–epidote mineral assemblage. No relicts of olivine or clinopyroxene are present. The composition of pillow lavas are komatiitic and high-Fe tholeiitic basalts with SiO₂ = 36.5–54.4 wt.% and Mg/(Mg + Fe_{tot}) × 100 = 26-57 with MgO content ranging from 5.3 to 16.9 wt.%. The rocks have shown LILE and LREE enrichment. Chondrite normalized REE patterns for the Aravalli pillow lava are nearly flat with (La/Sm)_N = 1.48-2.80, (Gd/Yb)_N = 1.41–2.67. The pillow lava geochemical characteristics are similar to those of high-Fe tholeiitic basalts reported in a previous works from this area [1,2]. The trace element systematics with the negative Nb, P and Zr anomalies of the basalts reflect the crustal contamination signatures. The Aravalli rocks can be treated as the result of island arc magmatism related to the subduction and accretion of the volcanic arcs [1].

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References

[1] Ahmad et al. 2008, Precambrian Research, 162, 150-159.

[2] Wiszniewska et al. 2009, 2nd Int. Conf. PCGT India, 10-12