

Geochemistry of the Deccan basalts from borehole KBH-7 of the Koyna Seismic Zone (India): nature of crustal contamination and sulfide saturation of magma

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The Deccan Traps have the similar conditions to host magmatic Ni-Cu-(PGE) sulfide deposits like the Noril'sk deposits (Russia) which is hosted within the conduits and intrusive system of the Siberian Traps. The high-volume of magmatism of the Deccan Traps has the ideal set of conditions that include picrites and available continental crust to contaminate the parental magma. The borehole KBH-7 (owned by MoES-BGRL) of the Koyna Seismic Zone contains ≈ 1251.23 m thick lava pile of the Deccan basalts. The borehole KBH-7 is situated at the western part of the Panchgoni seismic station and the southern part of the Koyna reservoir. Samples of four flow units (named as F_A, F_B, F_C, F_D; 1248.20-1110.78 m) from the lower part and four flow units (F_V, F_W, F_X, F_Y; 202.79-42.85 m) from the upper part of the borehole have been collected for this study. Modal abundance of plagioclase and clinopyroxene phenocrysts decreases from bottom to top of individual basaltic flow unit. Like other flows of the Deccan Traps, flows from the KBH-7 are also crustally contaminated. Seven samples from the lower part of F_B flow unit (1219.49-1213.11 m) have relatively higher MgO content (8.94-12.88 wt.%) and are characterized by higher degrees of contamination (Nb/Ta ≈ 1.99 -13.3) than other samples (Nb/Ta ≈ 6.61 -19.7). These MgO-rich samples are also characterized by higher Zr/Nb and Th/Nb ratios (Zr/Nb ≈ 7.92 -21.5, Th/Nb ≈ 0.15 -0.2). In Nb/Ta vs. Zr/Sm plot extremely low values of Nb/Ta ratios (<10) of some samples suggest that these might be contaminated by other contaminant along with the continental crust. Extreme lower Nb/Ta ratios (≈ 1.99 -9.67) of these samples are closely similar to the Nb/Ta ratios of some Gondwana sediments (e.g., Gondwana greywacke Nb/Ta ≈ 3.78 -12.77). In spite of the contamination, the studied basalts from the borehole KBH-7 are not showing any indication of sulfide saturation like the basaltic rocks of the Nadezhdinsky formation (Siberian Traps) from its chalcophile element concentration or ratios like Cu/Zr (>1 except one sample from flow F_B) and Ni/MgO (≈ 1.87 -163). This might be due to relatively higher iron content (11.93-15.87 wt.%) of the basaltic magma.