

# **Geochemical characterization and Nd isotopic study of Mesoproterozoic high-Ti and low-Ti mafic volcanic rocks from Betul Chhindwara Belt, CITZ, India**

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The Mesoproterozoic mafic volcanic exist in the Betul-Chhindwara Belt, which is part of Central Indian Tectonic Zone (CITZ). These mafics have undergone upper greenschist to lower amphibolite grade metamorphism with remnant pillow structure. The SiO<sub>2</sub> composition of metabasalts ranges from 45.15 to 52.86 wt% and MgO content ranges from 6.81 to 14.33%. But TiO<sub>2</sub> content divides the metabasalt into two groups, group I have higher Ti but low Mg# (TiO<sub>2</sub> =1.61 to 2.67 wt%) and group II have lower Ti but high Mg# (TiO<sub>2</sub>=0.17 to 0.94 wt%) content. Low Ti group is having higher Ni and Cr compared to high Ti group. Normalized REE profiles for both the group are almost similar showing almost similar slope with (Ce/Yb)<sub>n</sub> = 1.9 - 4.4 for group I which is little more than group II which is (Ce/Yb)<sub>n</sub> = 1.8 – 3.0. There is almost no Eu anomaly for both the groups, which indicates that plagioclase was not a major phase to fractionate. Metabasalts also show increase in FeO, TiO<sub>2</sub> and V with the decrease in the Mg#, probably indicating olivine fractionation. Fe and Ca decreases with decreasing Ti indicating clinopyroxene and iron-titanium oxide fractionation. Group I samples also have high Nd and Ce concentration indicating low degree of partial melting (5-10%) whereas group II samples have low Nd and Ce concentration indicating high degree of partial melting (10-20%). So, these variation in terms of Ti also indicate different degree of partial melting of an enriched mantle source. Metabasalts are generally enriched in incompatible elements such as Rb, Ba and depleted in Nb, Ti and P, which collectively are good indicators of continental crust/lithosphere involvement. Whole rock Sm-Nd isochrons for the mafic volcanic rocks indicate an age of crystallization for these volcanic rocks at about 1232±37 Ma (initial <sup>143</sup>Nd/<sup>144</sup>Nd =

0.510752±0.000035, mean square weighted deviate [MSWD] = 1.20) which is much younger to the basement rocks (1500 Ma). The  $\epsilon_{\text{Nd}}(t=1232 \text{ Ma})$  vary from -5.93 to -3.1 and DM model ages vary from 2204 to 3040 Ma which gives the extraction age of the mafic volcanic rocks from the enriched mantle.