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Geochemistry of Granitic rocks near Khajuraho, Bundelkhand craton, central India

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Abstract

The Bundelkhand craton or Bundelkhand Granitoid Complex (BGC) in Madhya Pradesh predominantly constitutes granitoid rocks and older metamorphics (Basu, 1986) and is a batholithic mass including multiple phases of granite represented by diversities in texture, mineralogy, mafic enclaves etc (Ghosh and Banerjee, 1982). The older metaporphics include migmatite, feldspathic schist, fine-grained mafics, schist, gneiss etc. as enclaves. The granites and older metaporphics are intruded by dolerite, olivine dolerite, basalt, gabbro and alkali rocks. Granitic rock outcrops occur as residual hills, tors, mounds etc. in and around Khajuraho town. Fresh rock surface can be seen at quarries near Bnsarai and Hatwaha villages. An attempt has been made in this paper to study the geochemistry of these granitic rocks, with the aid of 12 samples, using major, trace and rare earth elements (REE). The important major element concentrations (in weight%) are- SiO_2 (61.23- 74.92), Al_2O_3 (11.89- 13.87), CaO (0.35- 6.01), MgO (0.28- 5.01), TiO_2 (0.09- 1.12), MnO (0.04- 1.01) and P_2O_5 (0.03- 0.83). The K_2O content (4.23- 6.67 wt%) is higher than Na_2O (3.09- 4.8 wt%). The total alkali content ranges from 7.01- 9.89 wt%. In the QAP diagram (Streckiesen, 1976), the samples plot in the field of Monzogranite. The K_2O/Na_2O ratio ranges from 1.37- 1.39 wt%, indicating that these granites are potash rich. It is observed that silica and potash are in higher concentration than in the mafic enclaves wheres other major elements viz., CaO, MgO and Fe_2O_3 are low. In the normative Orthoclase- Albite-Anorthite (Or-Ab-An) ternary diagram of O'Connor, 1965, the samples plot in the 'granite to quartz-monzonite' field. The concentration of trace elements (in ppm) are- V (18.2- 389), Zr (11.5- 611), Y (11.5- 71), Cs (1.88- 672.85), Cu (11.2- 301), Pb (12.5- 552), Zn (10.5- 377), Ni (11- 701) and Co (11.23- 83). The ΣREE ranges from 7.81 to 501.12 ppm. In the chondrite normalized REE plot (Sun and McDonough, 1989), paucity in Eu concentration is observed indicating a plagioclase depleted melt at the source region. This further indicates that plagioclase is present as a fractionating phenocryst or as a residual soild in the source magma. The higher concentrations of LREE than HREE indicate fractionation and low dgree of partial melting.

Biography



Dr. P.R.C.Phani is a Senior Subject Matter Expert (Exploration & Mining) at Cyient Ltd., Hyderabad. He is an exploration geologist with over 18 years of experience in mineral exploration for diamonds, gold, iron ore and industrial minerals. He is recognised as a qualified person (RQP) by the Ministry of Mines, Government of India. Email id: phaniprc@gmail.com Mobile: +919440712698.



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Prof. M. Srinivas carries 30+ years of experience in academics and geological research. He is an active researcher and has published several research papers in journals of national and international repute. His field of interest is igneous petrology and geochemistry in general and alkaline and associated rocks in specific.