

# Geochemistry and Phase Equilibrium Modelling of Garnet-Biotite Gneiss from Mauranipur, Bundelkhand Craton, Northern India: Implication for Tectonic Setting and Metamorphism

Pratigya Pathak\*, Shyam Bihari Dwivedi and Ravi Ranjan Kumar

Department of Civil Engineering, Indian Institute of Technology (BHU), Varanasi-221005(UP), India

(\*Corresponding author, E-mail: pratigyapathak.rs.civ17@itbhu.ac.in)

## Abstract

The Mauranipur region is situated along the central part of the Bundelkhand Craton (BuC) in the northern Indian shield, which consists of garnet-biotite gneisses with various deformational structures in the form of folding, faulting, augen and tail structures. These deformation structures are tectonic imprints that reveal the tectonic nature of the garnet-biotite gneisses. The groundmass of Grt-Bt gneisses is characterized by presence of garnet, biotite, plagioclase, K-feldspar, quartz, and ilmenite. The phase equilibrium modelling and geochemical attributes depict the tectonic activity and metamorphic evolution of the studied rocks. The *P-T* pseudosection has been calculated in the NCKFMASHT system, which revealed that the peak mineral assemblage stabilized in the *P-T* range of 6.35–6.75 kbar and 755–780°C, and it further goes to retrograde metamorphism under *P-T* condition ranging from 4.80–5.28 kbar and 718–735°C. These gneisses represent a calc-alkaline to high-K calc-alkaline series of protolithic origin. The negative anomaly of Nb and Ti for all samples indicates that a subduction tectonic setting has occurred in the BuC. The  $(La/Lu)_N$  ratio and differences in the trace elements indicate heterogeneous sources and large variation in the degree of partial melting. The  $Y$  vs Nb and  $(Y+Nb)$  vs Rb tectonic discrimination diagrams indicate that the Grt-Bt gneisses have an affinity towards the volcanic arc granite and developed during subduction setting. The geochemical interpretation provides significant evidence that protoliths of Grt-Bt gneisses were further metamorphosed by the continent-continent collision.

**Keywords:** Garnet-biotite gneiss, Pseudosection, *P-T* condition, Geochemistry, Bundelkhand

(Received : 07 July 2021 ; Revised Form Accepted : 20 January 2022)

<https://doi.org/10.56153/g19088-021-0048-2>