

SUMMARY Of
MINOR RESEARCH PROJECT
On

GEOLOGY, GEOCHEMISTRY AND PETROLOGY OF GRANITE OF SOUTH AND
SW OF MUL AREA, OF WESTERN BASTAR CRATON, CHANDRAPUR DISTRICT
MAHARASHTRA, CENTRAL INDIA

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By

Hemraj W. Khandare

**DEPARTMENT OF GEOLOGY
M.G. College, Armori**

Introduction

Granitic rocks are a major component of the continental crust and the complex problems regarding their origin have attracted the attentions of geoscientists over a span of last 200 years. However, the precise outcome on the same is still a matter of challenge and trend of ongoing research. The current ideas of granite formation involve lower crustal melting, segregation, ascent (as dykes or diapirs) and emplacement in the upper crust. Similarly, establishing the granite petrogenesis has still remained a challenge despite numerous studies on granitic rocks of the continental crust (Leake, 1990). The main reasons for this are the relative contribution from the mantle and crustal sources, assimilation, fractional crystallization, degree of partial melting etc (Hill *et al.*, 1989).

The western Bastar craton (WBC) lying along the northern side of Godavari Graben exposes, a suite of Precambrian magmatic rocks of mafic-ultramafic and acidic composition, which is correlated to the Sukma Group of rocks. The western Bastar Craton exposes a granite body designated as the “Mul Granite Pluton” (MGP), which is intrusive into the Precambrian orthogneiss complex south of Mul in Chandrapur District, Maharashtra. The ‘Mul Granite Pluton’ (MGP) occupies ~ 300 km² in the northern part of Western Bastar Craton and exposed around Mul Tahsil in Chandrapur District, intruding the older basement rocks. Besides the main granite pluton, numerous narrow NNW- SSE quartz-syenite and granite bodies intrude the orthogneiss- granulite rock.

The Precambrian basement complex of WBC comprises of granulite-orthogneiss-granite suite, charnokite, hornblende-gneiss, pyroxenite, norite, gabbro and gabbroic anorthosite, which are intruded by younger granites and syenite. The mafic- ultramafic rocks i.e. pyroxenite, norite, gabbro and gabbroic anorthosite occurs as xenoliths within the hornblende gneiss.

Methodology

- Literature survey of Granite of India & other parts of the world. During the first year investigation the review of literature was collected by visiting various libraries of Nagpur and gone through various books and journals and upgraded the knowledge related to the topic of research.
- Field works for reconnaissance geological mapping and detail geological mapping. Field Visit to the research site twice in every month for sampling.

- The work includes geological mapping in and around Mul area covering parts of toposheet numbers 55P/12 and 55P/16.
- Collection of samples for mineralogical, petrological, geochemical & other studies.
- Preparation of thin sections and detail mineralogical / petrological studies of the granite and associated rocks supported by microscopic studies, and other instrumental techniques.

Aim And Objectives

- a) Geology Geochemistry and Genesis of granite of Mul area, Chandrapur district, Western Bastar Craton, Central India.
- b) Though lot of work has been carried out on the eastern Bastar craton, very little work has so far been carried out on the western Bastar craton in general and Granite of Mul area of Chandrapur district in particular.
- c) Therefore, during the present project detail geological mapping of Mul area will be carried out. Mineralogical, petrological and chemical studies of various silicate and oxide phases will be carried out using recently developed instrumental techniques.
- d) On the basis of these studies genetic model will be evolved for the granite of Mul area. Study of source of granite, their depositional environment and tectonic setting is also the part of the present study.

Brief Objective of Minor Research Project

The main objects of the project were:-

- a) Geology Geochemistry and Genesis of granite of Mul area, Chandrapur district, Western Bastar Craton, Central India.
- c) Though lot of work has been carried out on the eastern Bastar craton, very little work has so far been carried out on the western Bastar craton in general and Granite of Mul area of Chandrapur district in particular.

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d) On the basis of these studies genetic model will be evolved for the granite of Mul area. Study of source of granite, their depositional environment and tectonic setting is also the part of the present study.

Result and Observation

Based on the data generated and the interpretations presented in the preceding chapters following conclusions can be made:

- Granitic rocks are a major component of the continental crust and the complex problems regarding their origin have attracted the attentions of geoscientists over a span of last 200 years.
- The western Bastar craton (WBC) lying along the northern side of Godavari Graben exposes, a suite of Precambrian magmatic rocks of mafic-ultramafic and acidic composition, which is correlated to the Sukma Group of rocks.
- The western Bastar Craton exposes a granite body designated as the “Mul Granite Pluton’ (MGP), which is intrusive into the Precambrian orthogneiss complex south of Mul in Chandrapur District, Maharashtra.
- The ‘Mul Granite Pluton’ (MGP) occupies $\sim 300 \text{ km}^2$ in the northern part of Western Bastar Craton and exposed around Mul Tahsil in Chandrapur District, intruding the older basement rocks. Besides the main granite pluton, numerous narrow NNW- SSE quartz-syenite and granite bodies intrude the orthogneiss-granulite rock.
- The southern and western peripheries of the granite intermittently carry quartz-barite veins. Some of the barite veins near Phutana and Naleshwar are of economic significance.
- Copper mineralization is also observed in the area along fault at Dubarpeth and Thanewasna. It is associated with barite and minor gold.
- Mul granite has enclaves of pyroxenites and granite gneisses in them which suggest that MGP was emplaced into a host that had undergone granulite grade of metamorphism.
- The granite displays a typical hypidiomorphic texture. Mineralogically, the rock exhibits feldspars, quartz, minor biotite, hornblende, chlorite, zircon, zoisite, apatite and opaque (ilmenite and minor magnetite).

- Mul granite is mainly characterize by high silica and alkali content with moderate calcium, low to moderate alumina, low Mg and Ti.
- Tectonic discrimination diagram $(\text{MgO}+\text{FeOt}+\text{TiO}_2)/\text{SiO}_2$ vs $(\text{Al}_2\text{O}_3+\text{CaO})/(\text{FeOt}+\text{Na}_2\text{O}+\text{K}_2\text{O})$ suggested that samples of Mul granite falls under alkaline field.
- Tectonic discrimination diagram SiO_2 vs $\text{FeOt}/(\text{FeOt}+\text{MgO})$ and SiO_2 vs $\text{Na}_2\text{O}+\text{K}_2\text{O}-\text{CaO}$ throw lights on alkali nature of Mul granite.
- AFM diagram shows samples of Mul granite are of Calc-alkaline nature. The rocks are Metaluminous in nature as shown by the alumina saturation Index.
- The accessory mineralogy of biotite, hornblende, sphene and magnetite and absence of aluminous minerals indicate I- type granite nature of MGP. Besides, the overall linear pattern of the variation diagrams, suggest I- type affinity. Moreover, low to moderate alumina saturation index, moderate to low Ca content coupled with low Sr indicates A- type granite affinity of MGP. Thus combined mineralogical and chemical features suggest a mixed I and A- type nature for the MGP.
- The multicationic R_1-R_2 diagram showing samples of MGP fall in contact with Anorogenic and Late orogenic field
- The SiO_2 vs. Al_2O_3 diagrams shows the MGP fall in post orogenic granite field (POG) and this diagram can discriminate satisfactorily granites at $> 70\%$ SiO_2 levels.
- The trace elemental discrimination suggests a volcanic arc setting for the granites.
- The well preserved magmatic fabric and absence of deformation included planar features with relatively unaltered mineralogy suggests post-tectonic emplacement.
- The MGP has close spatial association with granulite grade rocks and occur as deep-seated post-tectonic emplacement.
- Enclaves of pyroxenites and hornblende gneisses occur within the granulite. It is suggested that the MGP was emplaced into a host that had undergone granulite grade of metamorphism.

Conclusion: weather it is beneficial to society, students, and researchers - Yes

- The southern and western peripheries of the granite intermittently carry quartz-barite veins. Some of the barite veins near Phutana and Naleshwar are of economic significance.

- Copper mineralization is also observed in the area along fault at Dubarpeth and Thanewasna. It is associated with barite and minor gold.
- If we start copper mine at Thanewasna, it will be helpful to the society for their Socio-economic development.