

## PETROLOGY OF THE POST-TECTONIC GRANITES FROM GUNDLUPET, SOUTHERN KARNATAKA

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THE South Indian craton is transected by lineaments, some of which are taphrogenic in nature<sup>1</sup>. These lineaments host many granite and syenite plutons of possible Pan-African age<sup>2</sup>. This paper records for the first time the occurrence of two granite bodies along the Moyar lineament near Gundlupet (lat. 11°45' N, long 76°43' E). The area around Gundlupet forms a part of the Sargur high grade terrain in southern Karnataka<sup>3</sup> and lies just north of the N70°E trending Moyar lineament. The lithologies include metasediments (pelites, calc-silicate rocks, quartzites, BIF and manganiferous horizons), amphibolites, various components of ultramafic-layered complex, and gneisses of various ages. Grey phase of the Peninsular gneiss is dated<sup>4</sup> 2.85 byr. The lithologies point to upper amphibolite facies metamorphism and show imprints of four major deformational episodes.

The granites of the present study occur as small bodies intruding into the Peninsular gneisses near Kodihalli and Mallayanpura. The contact of the granite body with the country rocks is marked by mylonite zones.

The medium- to fine-grained and light-pink granite shows hypidiomorphic granular texture and has the assemblage: quartz-plagioclase-K-feldspar-clinopyroxene-hornblende.

Quartz is generally anhedral with undulose extinction. Plagioclase (An 10–15%) is a minor phase and occurs as subhedral grains with moderately developed albite twinning, and is weakly sericitized. K-feldspar is anhedral with crosshatched twinning and occasionally contains string perthite. Clinopyroxene is feebly pleochroic and occurs as subhedral grains. Strongly pleochroic hornblende occurs around clinopyroxene with fused margins. The accessories such as zircon and apatite are found as inclusions within feldspars. Allanite is metamict, golden-yellow, and exhibits zoning. Sphene occurs both as ovoidal grains and as grains rimming magnetite. Calcite is subhedral and shows well-developed rhombohedral cleavages. Magnetite is

generally seen as granules in association with mafic phases and sphene.

Chemical analysis of the granites was done using XRF at the Department of Geology, University of Glasgow, Glasgow, UK. The analytical data for major and trace elements are given in table 1. The chemistry indicates that the granite is quartz normative. However, the presence of normative diopside (up to 15.5%) indicates alkaline nature. The granites show relatively low SiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> and higher Na<sub>2</sub>O and K<sub>2</sub>O (around 10%) when compared to the granites (s.s) reported elsewhere. The presence of clinopyroxene, amphibole, allanite, sphene and magnetite in the crystallizing assemblage is characteristic of I-type granites<sup>5</sup>. In the SiO<sub>2</sub>-log (K<sub>2</sub>O/MgO) diagram<sup>6</sup> (not given), the granites fall in the alkali post-orogenic granite region. When Al<sub>2</sub>O<sub>3</sub> + CaO + total alkalis/Al<sub>2</sub>O<sub>3</sub> + CaO - total alkalis is plotted against SiO<sub>2</sub> (ref. 7) (diagram not given), the granites fall in the alkali granite region.

Table 1 Major and trace element composition of granites from Gundlupet

Major elements					
	24	13a	Normative composition		
SiO <sub>2</sub>	65.62	60.17	Qz	15.65	5.34
TiO <sub>2</sub>	0.32	0.23	Or	42.72	33.36
Al <sub>2</sub> O <sub>3</sub>	14.93	12.72	Ab	20.65	33.01
Fe <sub>2</sub> O <sub>3</sub> *	3.79	6.01	An	8.43	5.56
MnO	0.02	0.21	Di	4.26	15.50
MgO	1.84	2.31	Wo	—	3.60
CaO	3.21	6.62	hy	3.81	—
Na <sub>2</sub> O	2.44	3.86	He	2.75	3.36
K <sub>2</sub> O	7.23	5.56	Mt	—	—
P <sub>2</sub> O <sub>5</sub>	0.33	0.74	Il	0.61	0.46
Total	99.83	99.05	Ap	0.78	1.68
Trace elements (ppm)					
V	47	ND			
Ni	—	5			
Cr	—	11			
Cu	—	2			
Zn	91	183			
Ga	17	21			
Rb	147	158			
Sr	811	884			
Y	47	57			
Zr	281	61			
Nb	19	13			
Ba	1665	1057			
La	78	246			
Ce	246	458			
Pb	66	23			
Th	198	73			
U	5	ND			

\*Denotes total iron.  
ND, not determined.

In the alkali-silica diagram<sup>8</sup>, the granites fall well within the alkaline region.

The granites contain higher Rb, Ba and Sr. Rb and Ba are partitioned in K-bearing minerals such as K-feldspar and biotite. The high Rb and Ba correlate well with the high modal K-feldspar. Sr is dominantly partitioned in plagioclase and other Ca-bearing minerals such as apatite and clinopyroxene. The granites of the present study, though containing higher Sr, have low modal plagioclase. To account for high Sr another mineral phase is required. Indeed the granites of the present study contain abundant clinopyroxene which have high Kd value for Sr.

The high field strength elements (HFS) such as Nb, Zr and Y are considered to be immobile during secondary processes and their abundance in the granite of the present study indicates alkaline affinity. The high concentration of LREE (La and Ce) is the unique feature of these granites. In the absence of analytical data on all the HREE the La/Y ratio can be taken as an indicator of LREE/HREE, as Y behaves like HREE<sup>9</sup>. The average La/Y ratio is 2.98, which is comparable with the reported ratios for the alkaline granites of Kerala<sup>2</sup>. The enrichment of both compatible (Ba and Sr) and incompatible (Rb) elements and low La/Y ratio suggest that the granitic melt has undergone only a limited fractionation. The high K/Rb ratio indicates a Rb-depleted source for the magma. The other compositional features such as low U content and very high Th/U ratio (compared to an estimated crustal average Th/U of ~3.8 (ref. 10) suggest that the source material was strongly depleted in U relative to Th. Such Rb and U depletion suggests a possible lower crustal granulitic source<sup>11</sup>. Melting of anhydrous granulites requires higher temperatures and pressures<sup>12</sup> and the rocks formed by these melts are relatively poor in normative quartz. Furthermore, near-minimum melts derived from rocks with high CaO will be generally more potassic. The presence of CO<sub>2</sub>-rich fluids in granulites<sup>13</sup> will cause partial melts to become more alkaline. Thus, based on field and geochemical data, a lower crustal granulitic source is suggested for the granites of Gundlupet.

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## TRITERPENES FROM THE LEAVES OF *RHUS ALATA* THUMB.

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IN continuation of our phytochemical investigations on *Rhus alata* Thumb.<sup>1</sup>, we now report the isolation and characterization of triterpenes benulin (I) and semimoronic acid (II). Benulin (I) has been reported earlier by Ionescu *et al.*<sup>2</sup> Semimoronic acid (II) has been reported in nature from only *Rhus semialata*<sup>3</sup> and it seems to be a characteristic phytoconstituent of *Rhus* species. Therefore, semimoronic acid (II) may be useful as a chemotaxonomic marker to establish interspecific relationships in the genus *Rhus*.

*Rhus alata* Thumb. was collected from Pachunga University College, Aizawl, Mizoram, and identified by Dr W. Husain, Department of Botany of this Uni-