Data Article

Petrology and geochemistry data of the Precambrian granitoids from the Hyderabad area, part of Eastern Dharwar Craton, Telangana state India

K. Praveena, M. Anjaneyulu, Ch. Narshimha, U.V.B. Reddy

A R T I C L E  I N F O

Article history:
Received 4 February 2018
Received in revised form 1 November 2018
Accepted 2 November 2018
Available online 7 November 2018

Keywords:
Precambrian gneisses
Granitoids
Mafic enclave
Dolerite dykes and chemical histories

A B S T R A C T

The data presented in this article are related to research to the research article entitled 'Petrology and Geochemistry Data of the Precambrian granitoids from the Hyderabad part of Eastern Dharwar Craton, Telangana state, India'. The granitoids from the Hyderabad area of the Telangana State are confined to the Precambrian gneissic complex of the northern-eastern part of Eastern Dharwar Craton. They cover 7760 Sq. km of the study area and fall between latitudes 16° 52‘–17° 42‘ N and between East longitudes 77° 21‘–77° 51‘ E. The granitoids are mainly classified into grey and pink granites, granodiorites and aplites. The field studies are understood they occasionally contain older mafic enclaves in the form of lensoid bodies and thin bands and cut by younger dolerite dykes, pegmatite and quartz veins and laboratory investigations resolved the classification of the granitoids and their chemical histories.

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* Corresponding author.
E-mail address: knreddy453@gmail.com (K. Praveen).

https://doi.org/10.1016/j.dib.2018.11.011
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### Specifications table

| Subject area                      | Earth science (Petrology) |
|----------------------------------|---------------------------|
| More specific subject area       | Geochemistry of Granites  |
| Type of data                     | Plots, Graphs             |
| How data was acquired            | Analysis using XRF        |
| Data format                      | Analyzed                  |
| Experimental factors             | *The granitoids are classified into granites, granodiorites and apalites.* |
| Experimental features            | *The field and laboratory relationship were determined.* |
| Data source location             | Hyderabad Granites, India |
| Data accessibility               | Data are available within this article |

### Value of the data

- The data can be used to understand the petrology and geochemistry of granitoids of the Hyderabad area.
- Granitoids are the predominant components of the Archaean cratons, constituting of 70–80% volume.
- They have been formed episodically from ~4.0–2.5 Ga producing compositionally varied suites with many overlapping characteristics. Their compositions suggest that they are produced by different petrogenetic processes in different geodynamic settings and are key to address numerous questions related to Archaean tectonics and crustal evolution processes.
- Utilized such relations to decipher phases of metamorphism and to distinguish different stages of migmatization and also used basic dykes to distinguish between younger and older granites.
- Precambrian gneisses often contain mafic bodies whose initial shapes have been greatly modified by deformation, migmatization and related phenomena. Basic bodies were one of the most important indicators of the kinematic history of a gneissic terrane.

### 1. Data

The dataset of this article provides information on the abundance of the Precambrian granitoids (granites, granodiorites and apalites) [9,12,13,17]. The Fig. 1 representing the modal analysis interpretation of the granitoids, Fig. 2 representing the mineralogical and textural features of the granitoids and Figs. 3–9 show the chemical variation diagrams to understand the chemical histories of the granitoids.

### 2. Experimental design, material and methods

Sampling was carried out based on the color, texture and lithological composition of the fresh rocks and un-weathered specimens were selected for rock thin section-preparation and were further selected for major elements determination using XRF techniques in NGRI Hyderabad India.

#### 2.1. Petrography

The Hyderabad area granitoids are generally massive, occasionally foliated and rarely gneissic. The rocks are leucocratic showing light grey to grayish pink in color. The petrographic study of these rocks exhibits equigranular and hypidiomorphic granular texture. The rocks are classified as syenogranite, monzo granite and granodiorite based on the modal % of quartz (Q), alkali feldspar (A) and plagioclase (P) by using classification scheme of [15]. The rocks are plotted in QAP triangular diagram after recalculating into 100%. On the basis of this mineralogical classification scheme of [15;16], the rocks...
Fig. 1. The QAP modal classification scheme for the rocks of the Hyderabad area after [15,8].

Fig. 2. (a) Pertitic texture is shown by pink granite. [scale 1000 μm, XPL] (b) Plagioclase altered to sericite and along the margins re-crystallized quartz accumulated pink granite [scale 1000 μm, XPL] (c) Inequigranular texture with big crystals of microcline perthite in grey granite [scale 1000 μm, XPL] and, (d) Myrmekitic texture in pink granite [1000 μm, XPL].
are plotted in syenogranite, monzogranite and granodiorite fields in the QAP diagram of [8] (Fig. 1). The primary minerals of granites include quartz, plagioclase, K-feldspars, hornblende and biotite occurring as essential minerals. Apatite, epidote and opaque constitute as minor phases. The secondary alteration products are represented by kaolinisation, sericitisation and chloritisation (Fig. 2b), in these rocks by the deuteric alteration of primary K-feldspar, plagioclase feldspar, hornblende and biotite. Microcline is occasionally altered to sericite, road Perthite is developed between plagioclase and K-feldspar by intergrowth phenomenon in grey granite (Fig. 2c). Deformed cross-hatched twinning is present in microcline (Fig. 2c and d); Carlsbad twinning is prominent in perthite containing opaque inclusions (Fig. 2a). Most of the quartz grains exhibit undulate extinction. Altered plagioclase exhibits variable degrees of alteration to sericite, selectively along the cleavage planes. Myrmekitic texture is uncommon in granitoids of the study area and it is formed by the intergrowth
between quartz and plagioclase at the margins of K-feldspar (Fig. 2d). Granites of the study area are of subsolvus type because of the presence of both feldspars. They show hypidiomorphic and granular texture with perthitic and myrmekitic intergrowths.

Formation of flame perthite can be explained by replacement reaction mechanism (Na-K exchange) between K-feldspar and plagioclase under low to moderate differential stress condition during rapid cooling [5]. Replacements of plagioclase by K-feldspar are common [3]. Fractured feldspars are probably a manifestation of submagmatic state as defined by [2] who suggested that the pink series have been derived from grey granite by potash metasomatism. In the present study area, granitoids are described as subsolvus in character due to the presence of two feldspars that are formed at below solvus ( < 400 °C) temperature under hydrous conditions.

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**Fig. 4.** Hyderabad area granitoids on Ab-An-Or normative diagram after [1].

**Fig. 5.** SiO₂ vs. Na₂O+K₂O wt%, binary diagram for the granitoid rocks from the Hyderabad area after [4].
2.2. Geochemistry of the granitoids

A total of 150 samples of granitoids from Hyderabad area were collected. Around 50 thin sections were prepared and studied. Data of 24 samples analysed for major and minor oxide (SiO₂, Al₂O₃, Fe₂O₃, MnO, MgO, K₂O, Na₂O, TiO₂ and P₂O₅) compositions using X-ray fluorescence spectrometry (XRF) at the CSIR-National Geophysical Research Institute (CSIR-NGRI), Hyderabad is presented.

The geochemistry of granitoids is controlled by their mineralogy including major, minor and accessories. The high proportions of felsic minerals (quartz, K-feldspar and plagioclase) of these rocks are responsible for high concentrations of SiO₂ (75.41–64.17 wt%) with an avg. 71.8 wt%, Al₂O₃ (12.22–15.17 wt%) with an avg. 14 wt %, K₂O (3.61–5.01 wt%) with an avg. 4.5 wt% and Na₂O (3.47–5.25 wt %) with an avg. 3.9 wt% (Table 1). Of the 24 samples, 20 have K₂O/Na₂O > 1 and remaining 4 with < 1 K₂O/Na₂O ratio. Mafic components (MgO, CaO and TiO₂) decreasing from granodiorite to monzo granite to syenogranite.

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**Fig. 6.** Na₂O+K₂O vs. SiO₂ wt%, binary diagram after [10] for the granitoid rocks from the Hyderabad area.

**Fig. 7.** A-F-M plot for the granitoids of the Hyderabad area after [7].

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2.3. Geochemical diagrams for granitoids

Harker diagram (Fig. 3) exhibits a decrease in the amount of MgO, TiO$_2$, CaO, P$_2$O$_5$ and total FeO with an increase in SiO$_2$. The negative correlation between SiO$_2$ vs CaO, SiO$_2$ vs TiO$_2$ and SiO$_2$ vs MgO indicating plagioclase fractionation as well as differentiation or fractional crystallisation and hence granodiorite is observed. The granitic rocks of the study area are plotted within the cal-alkaline field and show typical calc-alkaline trend in the AFM diagram of [7] (Fig. 7). Granites including aplite are in general toward alkaline (A) corner and granodiorites are in the interior of the calc-alkaline field.
Various geochemical discrimination diagrams are being used to classify the granitoids of the Hyderabad area and to understand their tectonic setting. The granitoids of the Hyderabad area lie in the fields of granite and granodiorite of the SiO₂ vs Na₂O + K₂O diagram (Fig. 5) after [4]. The major and minor oxide geochemistry of granitoids indicates that they are of sub-alkaline in nature. Majority of granitoid samples fall in granite, few in quartz monzonite and granodiorite fields of Na₂O + K₂O vs SiO₂ binary diagram (Fig. 6) of [10]. The granitoid samples are classified into granites, trondhjemites and lie at the boundary of the granodiorites (GGT) in the normative An-Ab-Or ternary diagram (Fig. 4) [1].

2.4. Magma type of the Hyderabad area granitoids

The granitic rocks of the study area are plotted within the calc-alkaline field and show a typical calc-alkaline trend in the AFM diagram of Irvine and Baragar (Fig. 7). Granites and aplite are in general trend toward alkaline (A) corner and granodiorites are in the interior of the calc-alkaline field.

2.5. Alumina Saturation Index (A/CNK)

[14] has suggested a diagram that is based on alumina saturation, calculated by the molar proportion of Al₂O₃/(CaO + Na₂O + K₂O)=A/CNK. Alumina Saturation Index (ASI) is an important parameter in the study of the granitoids. Granitic rocks with A/CNK values > 1 are termed as peraluminous and granitic rocks with A/CNK values < 1 are termed as metaluminous. The granitoids of the present study show both A/CNK values < 1 and A/NK values > 1 when plotted in the Shand diagram (Fig. 8). Based on these criteria, the granitoids of the study area are described to possess both metaluminous and peraluminous characteristics.

2.6. Modified Alkali-Lime Index (MALI)

Volcanic suites are divided into four classes according to the alkali-lime index of in his alkali-lime index diagram, the alkalies (Na₂O + K₂O) in a suite of lavas equaled to CaO at a given SiO₂ content [11].
If the alkali-lime index is \( > 61\% \) of SiO\(_2\) content, the suite of lavas are described as calcic; and if the alkali-lime index (ALI) is between 56–61\% SiO\(_2\) are called as alkali-calcic and it is \(< 51\% \) of SiO\(_2\) are known to be alkalic in character. The modified alkali-lime index (MALI) after Peacock 1931, was recently applied by [6] for the granitoids of the world. When we plotted the granitoids of Hyderabad area in MALI diagram (Fig. 9), spread over alkalic to calc-alkalic fields without confined to any single field. This shows that the studied suites not derived from the differentiation of a single parental magma. Based on the field, petrography and major element analyze of the granitoids of the Hyderabad area reveal that they are formed from the melts that are generated by partial melting of the lower crust due to magma-upwelling.

**Acknowledgments**

I would like to thank the Head Department of Applied Geochemistry for his support, I express my sincere thanks to Director, CSIR-NGRI for analytical support and my heartfelt thanks to UGC-BSR fellowship for financial support and sincere thanks to anonymous reviewers for their careful and constructive reviews.

**Transparency document. Supporting information**

Transparency data associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2018.11.011.

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