

## **Geology and petrography of Adolerite dyke, Hyderabad granitic region, Peninsular India**

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### **ABSTRACT**

*The 2.5 billion years Hyderabad granitic region (HGR), covering an area of ~ 150 x 150 km over the eastern part of the Eastern Dharwar Craton (EDC), is considered as largest granitic pluton of Indian subcontinent. (S.B. Singh, et.al). Region of this batholithic craton is composed with granitic gneisses and unclassified granites. This region was apparently formed due to extensive lower crustal remelting of permobile phases of older (3.3-2.9Ga) gneisses (Divakara Rao, 1996). Dykes of different composition were occurred within the craton. Extension, width and the crystallinity of these dykes different from one to another. Dykes in this craton are occurred more than hundred kilometers to very small dykes less than few hundred meters in dimension. Most of them are in N-S direction and NE-SW directions. The present study on the dyke occurred to the east of Hyderabad is an attempt to understand the crystallization history of basic magma.*

**Keywords:** Eastern Darwar Craton, Hyderabad Granite Region, dyke, mafic magma

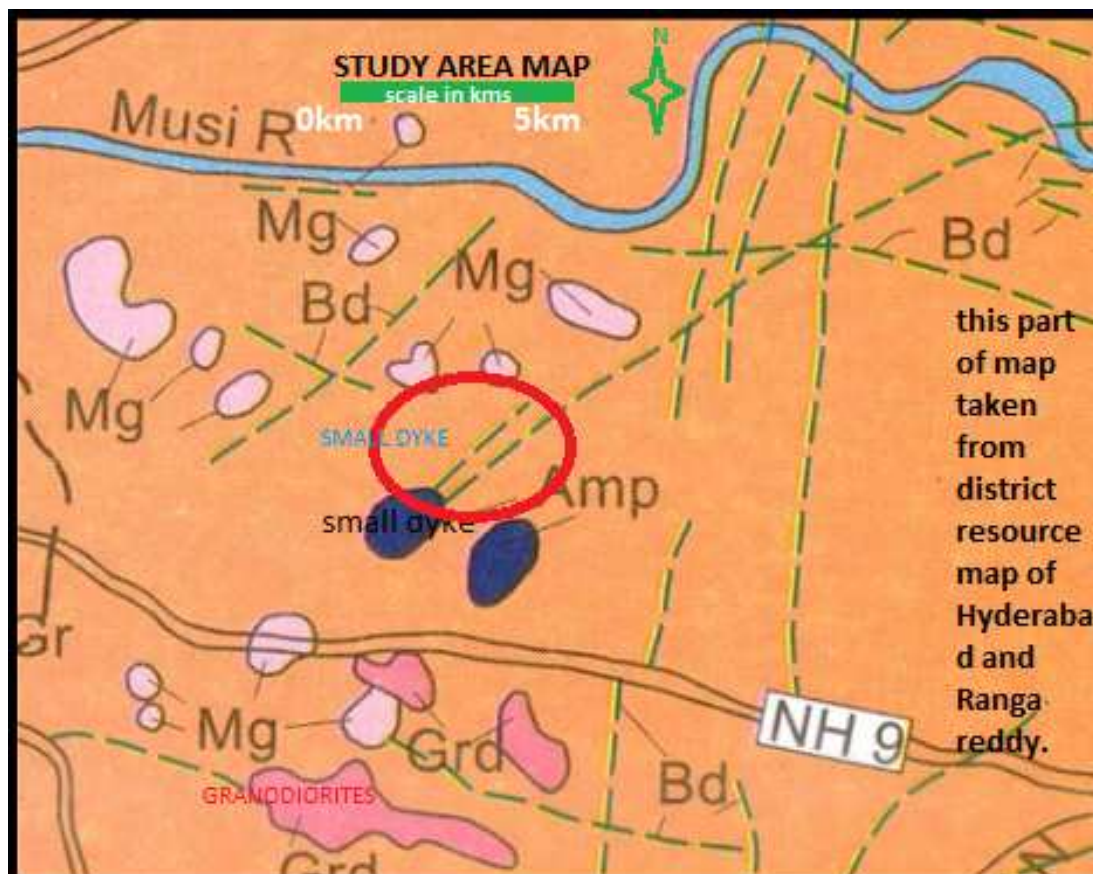
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### **INTRUDUCTION**

Dyke is a vertical form of an Igneous rocks that formed in a crack in a pre-existing rock body. Dikes can be divided into intrusive or sedimentary in origin. Dikes which are formed in the Hyderabad region are Magmatic dykes with different mineralogical compositions. Granitic rocks widely distributed throughout the HGR. They are gray and pink in color with medium to coarse-grained, inequigranular and massive. The cropped out bodies of the granitic rocks are denudational hills, dome shaped mounds, and boulders has higher topographical levels. Aplites are formed as cap rocks associated with fine grained quartzo-felspathic veins and pegmatites, quartz veins and reefs which trend NW-SE, N-S and NNE-SSW. Basic dykes of various compositions (dolerite, gabbro and pyroxenes) cut across granites in the area. These dykes are oriented E-W, NE-SW and N-S with widths of 7 to 50m and length up to several kilometers. Very few workers were studied the basic dykes in this region. In understanding the processes of crustal evolution, dykes may play vast role.

## MATERIALS AND METHODS

## Geology



Co-ordinates of the sample area N17.33347° E 078.62878°

Fig.1: Geological Map of the study area shows different litho units. A small dyke with in circular is sampled for petrography  
Amp= Amphibolite, Mg= Migmatites, Grd= Granodiorites, Bd= Basic dykes

Both type gray and pink granites were cropped out around the study area. They are coarser in grain size. The Hyderabad granitic region (HGR) forms part of the Eastern Dharwar Craton (EDC) of southern India and is covered by unclassified granites and granite gneisses of Archaean age (Crawford 1969), which are wide variety of felsic intrusive igneous rocks. Sitaramayya (1971) classified the rocks of the study area into three main varieties like pink, grey and leuco-granites besides the presence of pyroxene-bearing granodiorites and charnockite assemblages at places. The grey granites were dominated by Plagioclase feldspar and the pink granites were dominated by K-feldspars. Pink granites show relatively low magnetic response compared to grey granite indicating the presence of more ferromagnesian minerals in grey granite (Madhusudhan Rao et al. 2002). Within the grey variety the color ranges from grey to grayish pink. According to Balakrishna (1964) pink granite is derivative of metasomatism of potash feldspar from grey granite. Similar conclusion was drawn by Kanungo et al., (1975) stating that the pink granite has formed due to feldspathization of the grey granite. The grain size ranges from medium to coarse grained and at places fine grained nature observed in grey granite and display, in general, equigranular to porphyritic texture. The boundary between grey and pink granite is transitory and gradational in both lateral and in vertical directions, the origin being the same for both the rock types (Madhusudhan Rao et al., 2002).

The dykes of this region have importance hence the Eastern Dharwar Craton (EDC) has aged Precambrian era. The trends of the exposed dykes may indicate that their origin differ from each other. The exposed dykes may imply the nature of the upper mantle/ lower crusts composition. Dykes play vast role in understanding the crustal evolution process.



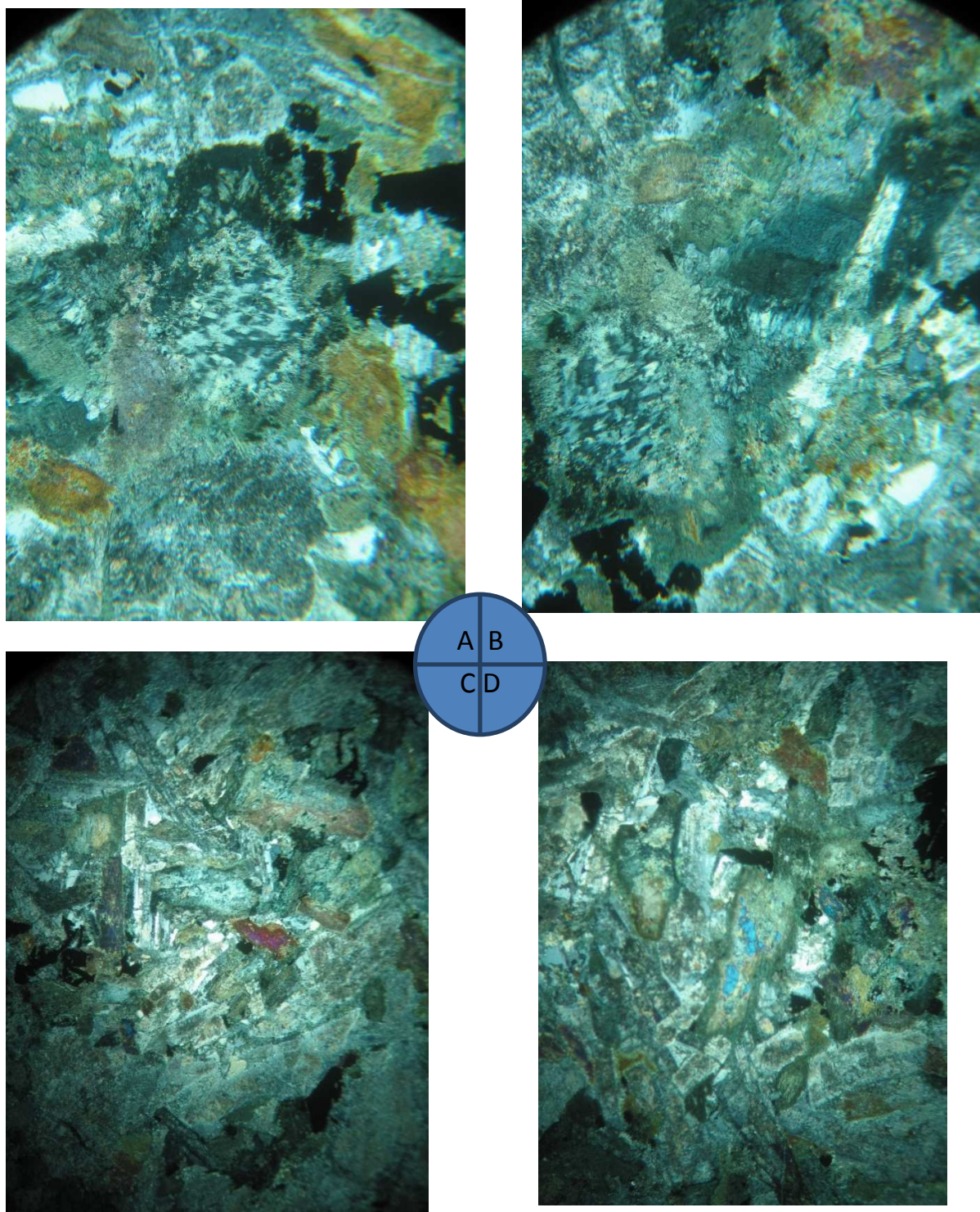


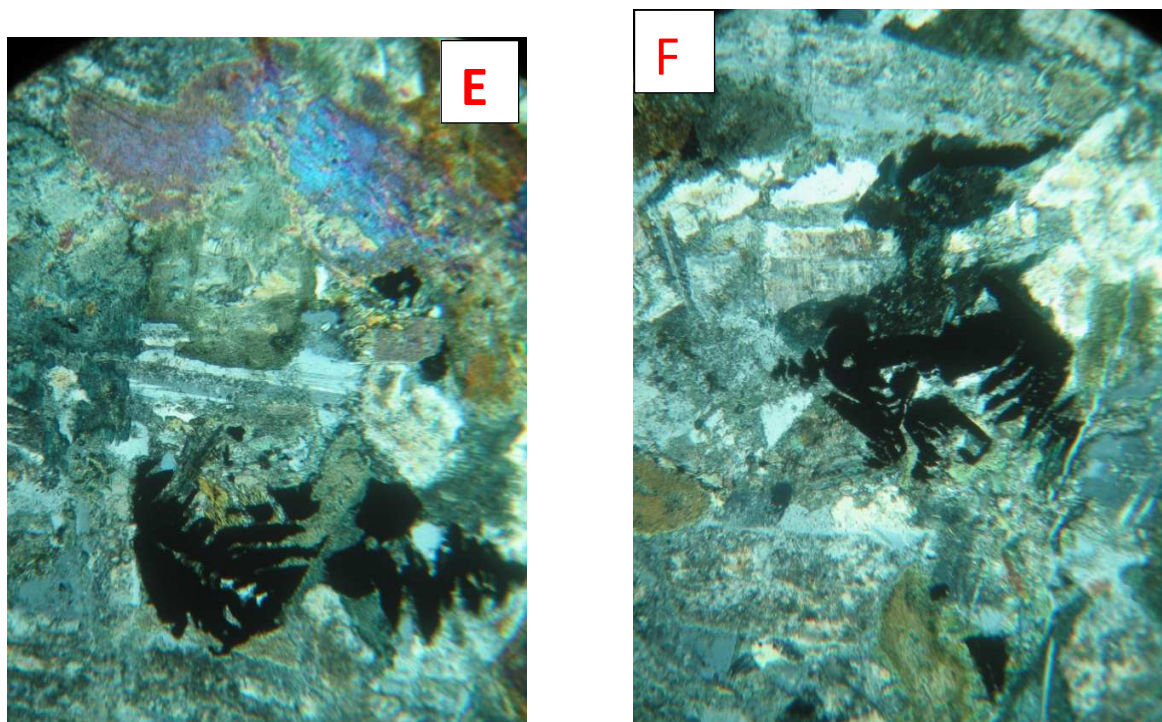
Fig.2: Microphotographs A and B show development of intergrowth texture. B and C show Altered grains of Orthopyroxene and Plagioclase. Most of the grains are subhedral in shape



## RESULTS AND DISCUSSION

**Petrography**

During the fieldwork four samples were collected all of them picked up from the outcrop for the petrographic studies. All the samples show similar characteristics. They are melanocratic, pheneritic, equigranular, and fine-medium grained igneous rock, forms of grains in the rock as a whole is Panidiomorphic crystallinity is holocrystalline and contains plagioclase and amphiboles orthopyroxene, opaque minerals. Approximate modal composition of specimens show the volume percentages of plagioclase, pyroxene, amphiboles, and opaques are 35+30+15+15 respectively remaining 5 percent is other accessories. Mineralogically, the dyke has no variation from sample to sample. It has sharp contact with the country rocks. It displays hypidiomorphic texture. Plagioclase and pyroxene identified as essential minerals, magnetite, amphiboles, sphene, and very lesser amount of olivine present as accessory minerals.



**Fig.3: Microphotographs of E and F show large grains of Magnetite that isenhydral, Quizzed by small grains of pyroxene minerals. Subhydal plagioclase grains have contact with Opx**

Plagioclase grains subhydal in shape and size approximate 5cms in dimension. Plagioclase grains can see in hand specimen. Even it has medium in grain size, the grain boundary or contact boundary between pyroxene not well developed. Most of the plagioclase grains show alteration. Magnetite crystalized early stage of crystallization process but rapid. They are in different shapes and sizes. Other mafic minerals intensely squeezed material in magnetite and or illmenite. Othopyroxene grains has clear boundary, moderately medium to high relief. The grains of orthopyroxene are subhydal in shape and size is similar to the plagioclase and distributed through the dyke. Very few grains of olivine observed with high relief. Few small grains of sphene found in matrix. The grains of plagioclase and pyroxene show irregular contact and alteration. Intergrowth texture observed may have been formed during the crystallization process.

## CONCLUSION

The present study of petrography of a dyke and the geology of the study area reveals that dyke with dolerite composition intruded where the granitic rocks were dominated in continental crust.

The continental crust made up of granitic rocks naturally they have brittle nature when they undergo high pressure and relatedly low temperature conditions. Beneath the crust, at high T & P conditions mafic magma generates and tries always to escape where low T&P conditions available. Here in this case the Hyderabad Granitic Region has good number of dykes with mafic- ultramafic composition that means the generation of mafic magma produced under certain depth conditions. Melts with mafic composition rapidly crystalized without giving chance to growth of crystals. Nucleation rate is high whereas the growth rate falls down. There is no formation of chilled margins that indicates the high viscous nature of the magma. The source magma rapidly intruded into granitic body and crystalized, that magma may have derived from lower crust.

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