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A note on the occurrence of olivine dolerite dyke near Hutti, Raichur District, Karnataka

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Abstract

An olivine dolerite dyke with 15 to 20% olivine is described as cutting the metabasalts of Hutti and the associated granites, and showing somewhat unusual chemical composition.

Geological set-up

Olivine dolerite occurs as a dyke trending roughly along N70°W – S70°E direction oblique to the strike of the schistosity plane (N10°W – S10°E approximately) in the Hutti-Maski schist belt. This dyke rock could be traced in two areas, viz; underground workings of Hutti Gold Mines (16°12′, 76°39′) and near Mudalgund (16°15′, 76°48′). The behaviour of the dyke is best studied in the underground levels of Hutti Gold Mines. The dyke varies from 1 metre to as much as 3 metres in width, showing a well-defined chilled margin. Dip of the dyke ranges from 70° to 75° to the south. The dyke has been traced in the mine workings up to a depth of 650 m. Although the regional trend of the dyke is at an angle (60°) to the schistosity plane or lode zones (lode zones are parallel to the schistosity plane), it shows local deviation in trend and becomes sub-parallel to the lode zones where it traverses the latter. This local variation in the dyke trend can be ascribed to the variation in composition and competency of the host rocks through which it cuts across. Lode zones are more schistose and have a composition different from the host metabasalt. Cross-cutting relation, absence of secondary planar or linear structure and metamorphic imprints indicate that emplacement of the dyke was post-tectonic with respect to deformation and metamorphism.

Petrography

Petrographic study shows the dyke to be an olivine dolerite made up mainly of olivine, pyroxene and plagioclase. Crystalline aggregates are characterised by two different grain size distribution—one, medium to coarse grained and the other, fine to medium, suggestive of two stages of crystallization.

Olivine: It forms 18-22% of the rock. Crystals are mostly euhedral, coarse-grained with high relief, and high order interference colours; $2V_Z$ 40°–60°, optically + ve. The mineral frequently alters to an aggregate of serpentine, antigorite and opaque oxide, occurring as pseudomorphs after the olivine crystals (Figs. 1 and 2). The released opaque oxide is mostly concentrated near the peripheral zones and cracks within the olivine grains. Although olivine forms stout independent crystals, it also occurs, in the form of euhedral inclusions in pyroxene.

Pyroxene: This forms 38-42% of the rock. It occurs both in the form of coarse prismatic crystals as well as fine to medium-grained aggregates intergrown with plagioclase. The coarse phenocrysts (Fig. 2) and the fine grained crystalline aggregates (groundmass) are clinopyroxenes (diopside/augite) with $Z \wedge c$ 22° to 40°, $2V_Z$ 60°, optically + ve. No compositional difference between the phenocrysts and the groundmass pyroxene could be observed.

Plagioclase: It forms 35-40% of the rock. Crystals characteristically form long narrow laths with tapering ends, intergrown with bladed clinopyroxene (diopside/

augite). This peculiar growth simulates 'quench' texture indicating sudden chilling. Distribution of the laths show either radial or subparallel growth and at places fibre-like. They show a limited range of composition varying from An_{50} to An_{60} (labradorite).

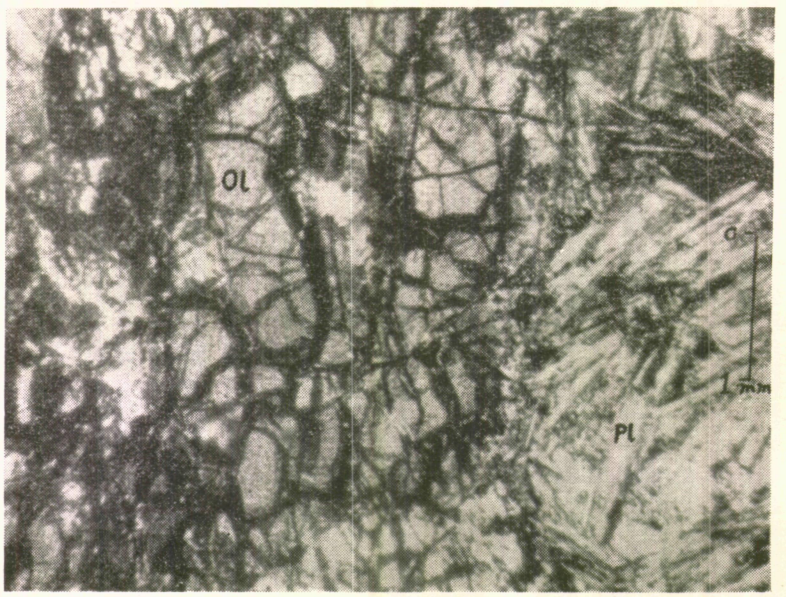

Figure 1.

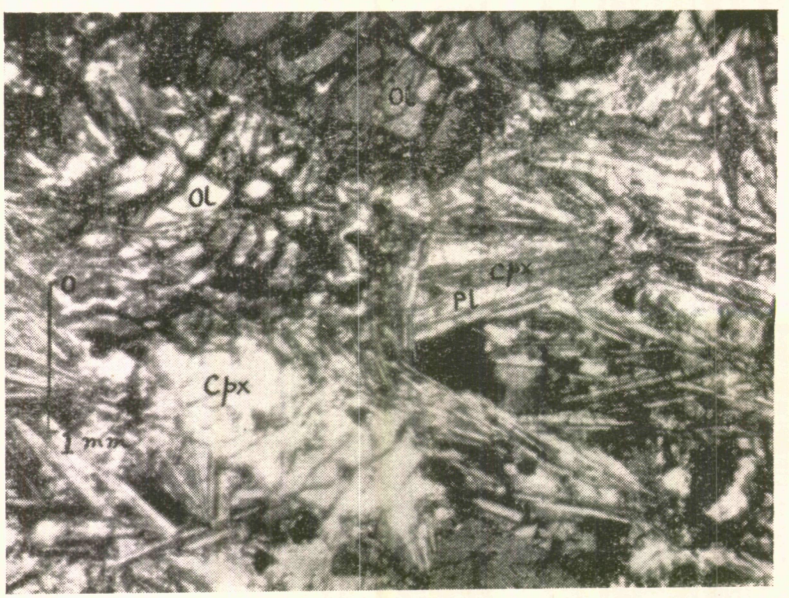

Figure 2.

The dolerite exhibits hypidiomorphic inequigranular with porphyritic and sub-ophitic texture. Porphyritic texture is shown by the phenocrysts of olivine and coarse clinopyroxene grains. Sub-ophitic texture is exhibited by the interstitial grains of

plagioclase and clinopyroxene. Textural study shows that olivine is the first mineral to crystallize, followed by clinopyroxene—both forming coarse euhedral to subhedral crystals under relatively stable conditions. Subsequent to this there was simultaneous and perhaps rapid crystallization of clinopyroxene and plagioclase, producing 'quench' texture. It can be inferred here that after the slow crystallization of olivine and some clinopyroxene grains, the magma (liquid+solid) probably emplaced at higher level causing rapid crystallization of the residual liquid. This indicates a two-stage crystallization history for the rock.

Chemical composition

Chemical analysis of one representative sample of the dyke rock is presented in Table I. The rock is characterised by $CaO/Al_2O_3 > 1$ and low K_2O content ($< 0.9\%$). The chemical composition corresponds (but not exactly similar) to basaltic komatiite from Barberton area (Viljoen and Viljoen, 1969).

TABLE I. *Chemical analysis of an olivine dolerite dyke sample (PD-2) from Hutti*

Oxides	Wt. %	Norm		
SiO_2	49.52	Feldspar	Orthoclase	3.34
Al_2O_3	10.09		Albite	24.89
TiO_2	1.55		Anorthite	11.12
MgO	8.14			39.35
CaO	11.16	Nepheline	1.56	
Fe_2O_3	0.64	Diopside	35.77	
FeO	12.54	Olivine	17.00	
Na_2O	3.28	Magnetite	0.94	
K_2O	0.56	Ilmenite	2.89	
MnO	0.25	Apatite	0.33	
P_2O	0.15	H_2O	1.31	
H_2O	1.31	Trace elements in ppm.		
		Ni	45	
Total	99.19	Co	58	
		V	47	
		Cr	440	
		Cu	340	
		Ga	22	
		Pt	44	

Analyst: K. K. Raju

Normative values calculated (Table I) from the chemical composition, show that the rock is an olivine dolerite. Trace element values show high Cr (440 ppm) and Cu (340 ppm) values.

Conclusion

The main purpose of the paper is to report the occurrence of few olivine dolerite dykes at Hutti showing certain characteristic mineralogical and textural features and somewhat uncommon chemical composition. This dyke intrudes the Hutti schists as well as the biotite granodiorite-adamellite and is the youngest intrusive in the region. Majority of the youngest Precambrian basic dykes in the Karnataka craton are represented by gabbro and dolerite (olivine: 0–5%) having tholeiitic composition. Occurrence of olivine dolerite (olivine: 15–25%) belonging to cratonizing dykes in

the Precambrian is somewhat rare, the other recorded occurrence being the komatiite dyke of Dodkanya, Mysore District (Srinivasan *et al.*, 1975).

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Girujan Clays of Upper Assam—Marine or Continental?

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Abstract

The clays are generally rich in montmorillonite, kaolinite, expandable mixed-layers and degraded illite. Laboratory data indicate two types of sections depending on response of clay minerals to potassium saturation. A partially truncated weathering profile developed under continental conditions is suggested.

Introduction

Girujan Clays constitute a distinct lithological unit of the Girujan Clay Stage belonging to the Middle Tipam Series in Assam. By its characteristic mottling and argillaceous character, it provides a useful stratigraphic marker in the delimitation of the Tipam Series and its further subdivision into stages. Generally, it occupies low-lying flat ground where the clays have a thickness varying from 500-850 m and consisting of, besides mottled clays, red and/or pink sandstones and silts. Besides Upper Assam, Girujan Clays ore also exposed in parts of Cachar, Dikcha, Digboi, Dhansiri valley and Naga hills. Pascoe (1964) has mentioned the occurrence of silicified wood or wood partly silicified and partly carbonized from this bed. The Stage shows considerable variation in lithological facies either as a whole or individually by its constituent units.

Considerable differences of opinion exists on the origin of Girujan Clays and it is often a matter of doubt as to whether they are marine and/or continental in nature. The present investigation is intended to understand the mode of origin and deposition of these clays.

Scope of work

Subsurface samples were analysed for gross clay mineralogy as given in Table I. It is apparent from Table I that Girujan Clays occur between 850-2200 m at Galeki,

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