JOURNAL GEOLOGICAL SOCIETY OF INDIA
Vol.48, Oct. 1996, pp. 457-461

SHORT COMMUNICATIONS

Spinifex Textured Komatiite From Archaean Greenstone Sequence of Singhbhum District, Eastern India

Spinifex textured perditotic Komatiites from Dhipasai-Sonajuri area, Singhbhum (East) - Bihar are reported for the first time. Deformed pillows and polyhedral joints are also recorded in the ultramafics of the area.

Introduction : Spinifix-textured komatiite is a typical rock of the Archaean greenstone belts of the world. This texture is considered as diagnostic of Archaean ultramafic rocks and appears to result from the comparatively rapid cooling of Mg-rich magmas. It is commonly preserved in the upper portion of ultramafic komatiitic flows and is characterised by randomly oriented serpentinised skeletal crystals of olivine or pyroxene similar in appearance to spinifex grass in western Australia (Condie, 1981). In Indian subcontinent spinifex-textured ultramafic Archaean komatiites have been reported from the Holenarsipur schist belt (Hussain and Naqvi, 1983) and basal volcanic group of Kibbanahalli area of the Chitradurga schist belt of Karnataka (Srikantia and Bose, 1985; Radhakrishna and Naqvi, 1986). In the eastern Indian shield spinifex-textured peridotitic komatiite with 36% MgO is reported for the first time from the ultramafic volcanics of the Archaean supracrustals near Dhipasai (Fig.1).

Geological Setting: The Archaean supracrustal rocks of the Dhipasai area belong to the Iron Ore Group of Sarkar and Saha (1977). The supracrustals comprise a sequence of mafic-ultramafic volcanics, volcanogenic sediments, BIF, meta-argillites with greenschist facies of metamorphism. The litho-assemblage is engulfed and intruded by Singhbhum Granite (c.3.3. Ga, Saha, 1994) as manifested by the presence of tongues and apophyses near Galusingh (22°33'09": 86°42'20") and presence of xenoliths of supracrustals within Singhbhum Granite constitute the typical Archaean granite-greenstone sequence, being the northern extension of Badampahar-Gorumahisani schist belt which bifurcates at Kunderkocha (22°22'50" : 86°14'30")with one arm extending northwesterly towards Rajnagar (22°37':86°45') and the other arm trending northerly towards Potka (22°37': 86°13'25").

Description of the spinifex-textured komatiite: Spinifex texture in peridotitic komatiite is mainly of radiating type (Fig.2) but plate and porphyritic types are also recognised in the ultramafics of the area. Besides spinifex texture, presence of deformed pillows and polyhedral jointing cracks are found in the ultramafic rock near Sarongposi, east of Chukapahar (22°36'36" :86°06'18") and Sonajuri (Fig.1) suggesting to be a komatiitic lava flow of volcanic origin.

Mineralogically, the komatiites contain ramdomly oriented bladed serpentine up to 30 mm long, pseudomorph after olivine in a groundmass containing serpentine, talc, chlorite, clinopyroxene, tremolite and magnetite.

Chemistry: Chemical analysis of a representative sample of komatiite from Dhipasai area using XRF method shows high MgO content, low Al_2O_3, alkalis, TiO_2, P_2O_5 and higher levels

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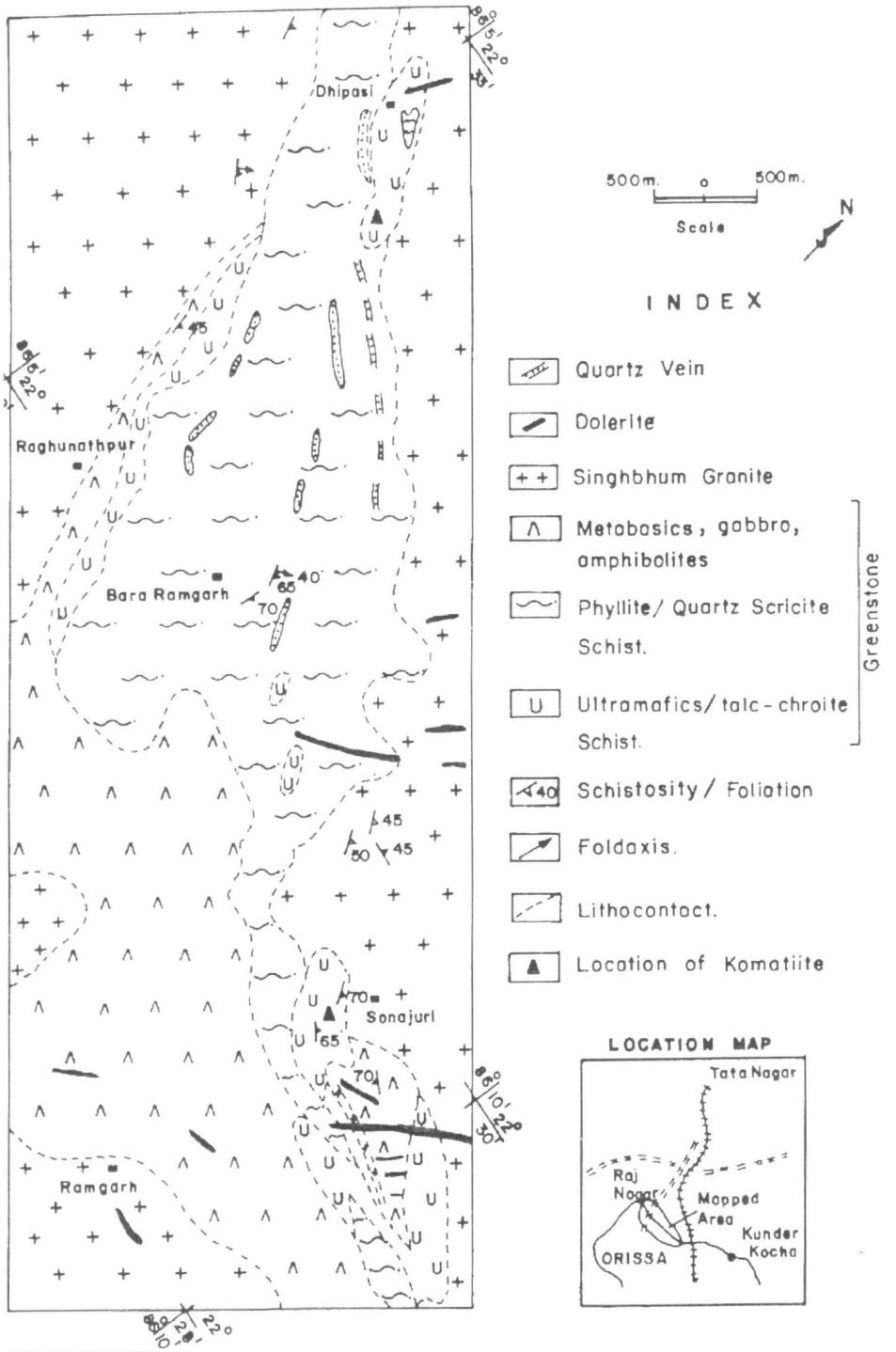

Fig.1. Geological map showing Dhipasai-Sonajuri area, Singhbhum (East) Bihar.

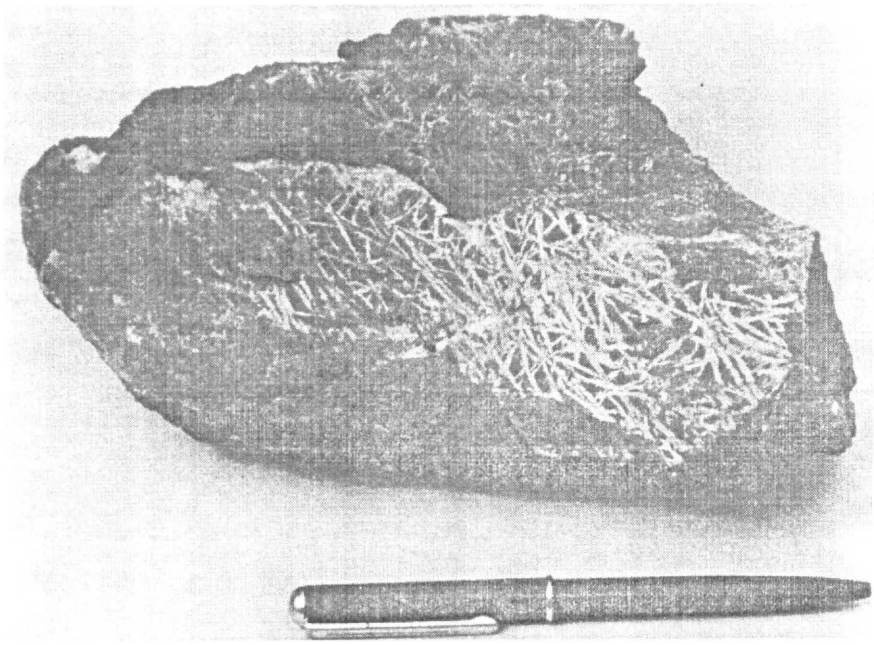

Fig.2. Spinifex textured peridotitic komatiite of Dhipasai area.

of Ni and Cr (Table I). The rock is olivine normative with high CaO/Al_2O_3 and low Al_2O_3/TiO_2 suggesting affinity with the Barberton type of komatiite (Viljoen and Viljoen, 1969). High Mg number also indicates composition that of Archaean komatiite (Glikson, 1983). In $(FeO+Fe_2O_3+TiO_2)$-CaO-MgO diagram (Viljoen and Viljoen, *op. cit*) the sample falls in

Table I.

	1	2	3
SiO_2	42.25	42.10	42.52
TiO_2	0.28	0.33	0.18
Al_2O_3	0.90	2.73	3.44
Fe_2O_3	3.36	0.00	4.92
FeO	4.77	9.75	5.87
MnO	0.21	0.17	0.19
MgO	36.73	30.54	30.27
CaO	4.10	4.26	4.96
Na_2O	0.01	0.15	0.41
K_2O	0.01	0.03	0.16
P_2O_5	0.04	0.04	0.02
LOI	7.57		

1. Dhipasai area. 2. Barberton area.
3. Av. spinifex-textured komatiite, Komati Formation, S. Africa.

Table 1 contd.....

	Dhipasai area (values in ppm)		
Ni	1300	Sc	15
Cr	1000	Co	123
La	1.60	Hf	0.8
Ce	4.00	Ta	0.4
Nd	3.10	CaO/Al_2O_3	4.5
Sm	2.80	Al_2O_3/TiO_2	3.2
Eu	0.27	CaO/TiO_2	14.6
Tb	0.15	MgO/TiO_2	131.1
Yb	0.45	MgO/Al_2O_3	40.8
Lu	0.07	FeO_t/TiO_2	30.9
Th	0.73	Mg. No.	73

periodotitic komatiite field. The REE profile (Fig. 3) resembles those of different komatiitic lavas of the world and falls within the field of REE pattern of the komatiites (Fig.3a). The

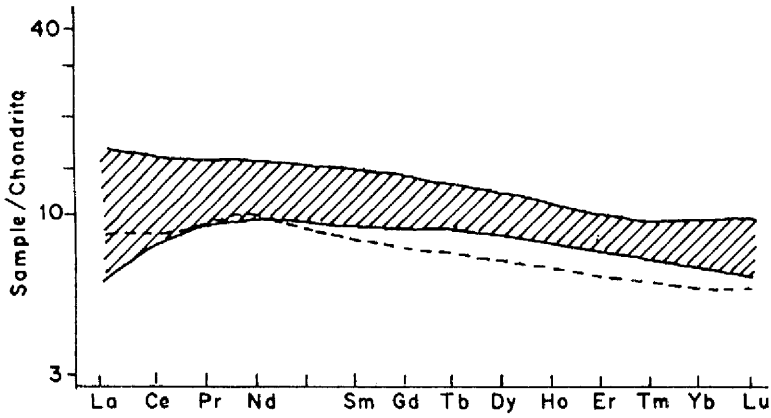

Fig.3. REE pattern of a sample of Komatiite Normalising Values after Evensen et al. (1978). Shaded area: Range of normalised REE abundances for World Komatiites. Normalising values after Sun and Mc Donough (1989).

present sample represents LREE enriched and HREE depleted komatiite with $(La/Sm)_N = 1.14$ (Henderson, P., 1984).

Acknowledgement: The authors are grateful to Dr. S.K. Mazumder, Dy. Director General, Geological Survey of India, Eastern Region, Calcutta, for his constant encouragement.

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References

GLIKSON, A.Y. (1983). Geochemistry of Archaean tholeiitic basalt and High Mg to peridotitic komatiite suites, with petrogenetic implications. Mem.4, Geol. Soc. India, pp.73-95.

EVENSEN, N.M., HAMILTON, P.J. and O'NIONS, R.K. (1978). Rare earth abundances in chondritic meteorites. Geochim. Cosmochim. Acta, 42 : pp.1199-1212.

HENDERSON, P. (1984). Rare Earth Element Geochemistry. Elsevier.

HUSSAIN, S.M. and NAQVI, S.M. (1983). Geological, geophysical and geochemical studies over the Holenarsipur schist belt, Dharwar craton, India, in Naqvi, S.M. and Rogers, J.J.W., *eds*. Precambrian of south India. Geol. Soc. India, Mem.4, pp.73-95.

NESBITT, R.W., JAHN, BOR-MING and PURVIS, A.C. (1982). Komatiites-an early Precambrian phenomenon. Jour. Volcanonology and Geothermal Res., 14, pp.31-45.

RADHAKRISHNA, B.P. and NAQVI, S.M. (1986). Precambrian continental crust of India and its evolution. The Jour. of Geol., v.94, No.2, pp.145-166.

SAHA, A.K. (1994). Crustal evolution of Singhbhum-North Orissa, Eastern India, Mem.27, Geol. Soc. India, pp.1-341.

SRIKANTIA, S.V. and BOSE, S.S. (1985). Archaean komatiites from Banasandra area of Kibbanahalli arm of Chitradurga supracrustal belt in Karnataka. Jour. Geol. Soc. India, v.26, pp.407-417.

VILJOEN, R.P. and VILJOEN, M.J. (1969). Evidence for the composition of the primitive mantle and its products of partial melting from the study of the rocks of the Barberton Mountainland. Geol. Soc. S. Africa, Sp. Publ., v.2, pp.275-296.

(Received : 7 March, 1996; Accepted : 13 April, 1996)