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Possible spinifex texture in a serpentinite from Karnataka

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Introduction:

A lensoid serpentinite showing relict spinifex texture has been recently located in the Ghatti Hosahalli band, close to the western margin of Chitradurga schist belt in Karnataka craton. This is the first record of a possible spinifex texture in the ultramafites of India.

Spinifex texture represents sheaves of bladed olivine and/or pyroxene set in an aphanitic matrix (Nesbitt, 1971; Pyke *et al,* 1973). This texture is regarded as diagnostic of Archaean ultramafic rocks from greenstone belts, and is generally accepted as having resulted from rapid cooling (distinct from super cooling) of a crystal-free ultramafic liquid *in situ.* It has been variously disignated as crystalline quench texture (Viljoen and Viljoen, 1969), quench texture (Gelinas and Brooks, 1974) and informally as 'bird track', 'chicken track', 'feather', etc. The term spinifex texture originated in Australia based on its broad resemblance to spinifex grass, and has now gained wide currency. It has superficial resemblance to 'harrisitic structure' or olivine crescumulate texture (Wager and Brown, 1968) but differs from it in its associated cumulus phases, textural details, and geological milieu.

Geological setting:

The Ghatti Hosahalli band, approximately 15 km long and 300 m wide, represents a linear, *en echelon* array of enclaves of high grade supracrustal rocks, consisting mainly of fuchsite quartzites with subordinate serpentinites, steatites and amphibolites. The fuchsite quartzites are locally rich in sillimanite, kyanite, staurolite and chloritoid. Bedded barytes are interstratified with fuchsite quartzites (Radhakrishna and Sreenivasaiah, 1974).

This band is broadly discordant to the main, low-grade Chitradurga greenstone belt, which rests on Peninsular Gneiss with a pronounced unconformity marked by a basal, oligomict conglomerate at Nerlakatte. The band is correlated with the Sargur Supergroup, which is older than the greenstone sequences of Dharwar Supergroup in Karnataka (Viswanatha and Ramakrishnan, 1975).

Description of the spinifex rock:

A lenticular serpentinite, about 150 x 50 m in dimension, is exposed in association with fuchsite quartzite on the hillock to the east of Jankal-Talya road, about 2 km south of Kummanghatta (13°59' : 76°18' C/5). This serpentinite megascopically shows spinifex-like texture, with bladed crystals stacked randomly and accentuated by thin stringers of magnetite (Fig. 1). In thin sections, the rock is almost entirely made up of serpentine minerals (mainly antigorite) with streaks of magnetite. Within the finegrained felt of serpentine are embedded elongate plates of antigorite, suggesting a relict spinifex texture (Fig. 2). Probably the amphibolite facies metamorphism and intense deformation have erased the original mineralogy, but still retaining the blade-like serpentine pseudomorphs.

Figure 1. Outcrop of serpentinite showing blades of serpentine pseudomorphs, Kummanghatta.

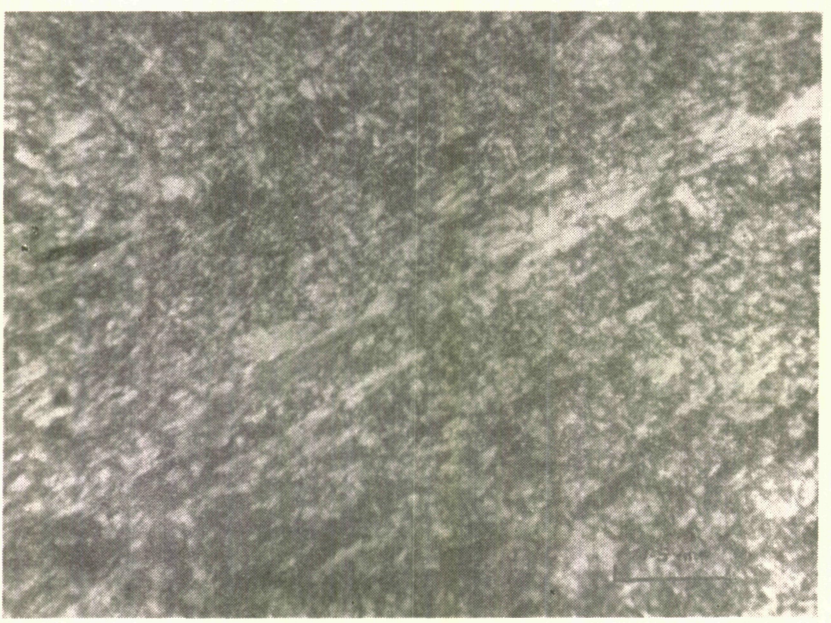

Figure 2. Acicular antigorite in a fine grained matrix of serpentine minerals.

Chemistry:

The major element chemistry of the serpentinite is given below and compared with similar rocks from the Archaean greenstone-granite terrains of the world.

	1	2	3	4
SiO_2	40.71	41.61	41.00	41.16
TiO_2	0.19	0.31	0.21	0.20
Al_2O_3	2.58	2.70	5.54	1.12
Fe_2O_3	2.21	5.63	3.46	5.75
FeO	9.84	4.35	6.16	0.95
MnO	0.08	0.17	0.13	0.13
MgO	35.42	30.35	32.00	33.83
CaO	1.41	4.29	4.21	2.89
Na_2O	0.13	0.15	0.28	—
K_2O	0.05	0.03	0.07	0.05
H_2O^+	6.43	8.81	5.47	13.01

1. Serpentinite from Kummanghatta, Ghatti Hosahalli band.
2. Average peridotitic komatiite, Komati Formation Viljoen and Viljoen, 1969).
3. Ultramafic flow, Munro Township (Pyke *et al*, 1973).
4. Subschistose green serpentinite, Nuggihalli belt (quoted from Viswanathan, 1974).

Allowing for minor variations in CaO, Al_2O_3 and SiO_2, during serpentinisation, the diagnostic features of high MgO and low K_2O and Na_2O of the serpentinite compares favourably with komatiites.

Conclusions:

In contrast to the postulate of Viljoen and Viljoen (1969) that peridotite komatiites are derivatives of primitive Archaean mantle, it has now been shown that they erupted on an early continental crust (McCall, 1973; McIver and Lenthall, 1974; Bickle *et al*, 1975). This is consistent with the association of komatiites with the sial-derived rocks of Sargur Supergroup in Karnataka (Swami Nath *et al*, 1976). The komatiitic ultramafites described so far from Karnataka are schistose and deformed rocks, which lack primary textural features. Probably an intensive search in the craton may bring to light better-preserved spinifex-textured ultramafites.

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References

BICKLE, J. J., MARTIN, A. and NESBITT, E. G., (1975) Basaltic and peridotitic komatiites and stromatolites above a basal unconformity in the Belingwe greenstone belt, Rhodesia. *Earth and Planet. Sci. Lett.*, v. 27, pp. 155-162.

GELINAS, L. and BROOKS, C., (1974) Archaean quench-texture tholeiites, *Can. Jour. Earth Sci.*, v. 11, pp. 324-340.

McCALL, G. J. H., (1973) Geochemical characteristics of some Archaean greenstone suites of Yilgarn structural province, Australia. *Chem. Geol.*, v. 11, pp. 243-269.

McIVER, J. R. and LENTHALL, D. H., (1974) Mafic and ultramafic extrusives of the Barberton Mountain Land in terms of the CMAS system. *Precambrian Res.*, v. 1, pp. 327-343.

NESBITT, R. W., (1971) Skeletal crystal forms in the ultramafic rocks of the Yilgarn block, Western Australia : evidence for an Archaean ultramafic liquid. *Geol. Soc. Austr. Spec. Publ.* 3, pp. 331-347.

PYKE, D. R., NALDRETT, A. J. and ECKSTRAND, O. R., (1973) Archaean ultramafiic flows in Munro Township, Ontario, *Geol. Soc. Am. Bull.*, v. 84, pp. 955-978.

RADHAKRISHNA, B. P., and SREENIVASAIAH, C., (1974) Bedded barytes from the Precambrian of Karnataka.. *Jour. Geol. Soc. India*, v. 15, pp. 314-315.

SWAMI NATH, J., RAMAKRISHNAN, M. and VISWANATHA, M. N., (1976) Karnataka Craton evolution. *Rec. Geol. Surv. India*, v. 107, pt. 2, pp. 149-175.

VILJOEN, M. J. and VILJOEN, R. P., (1969) Evidence for the existence of a mobile extrusive peridotite magma from the Komati Formation of the Onverwacht Group. *Geol. Soc. S. Afr. Spec. Publ.* 2, pp. 87-112.

VISWANATHA, M. N. and RAMAKRISHNAN, M., (1975) The pre-Dharwar supracrustal rocks of Sargur schist complex and their tectono-metamorphic significance. *Indian Mineralogist*, v. 16, pp. 48-65.

VISWANATHAN, S., (1974) Contemporary trends in geochemical studies of the Early Precambrian greenstone-granite complexes. *Jour. Geol. Soc. India*, v. 15, pp. 347-379.

WAGER, L. R. and BROWN, C. M., (1968) *Layered igneous rocks.* Oliver and Boyd., p. 588.

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