MANGANOAN SPHENE FROM GARRA BALAGHAT DISTRICT, MADHYA PRADESH, INDIA

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At Garra, Balaghat Districht, Madhya Pradesh, India, regionally metamorphosed manganese orebodies and manganese silicate rocks (gondite) occur as interbanded bodies in Precambrian Sausar Group and these are often cut across by pegmatite veins and dikes of different dimensions. The gondites and manganese orebodies occupy the Lohangi zone at the contact of Mansar and Lohangi Formations of the Sausar Group and are made up of spessartite-quartz-rhodonite and the lower oxides of manganese, respectively. The discordant pegmatite bodies of calcalkaline composition, at their contact with gondite and manganese orebodies, show concentration of manganese-bearing silicate minerals such as blanfordite, winchite, spessartite, tirodite and brown manganiferous pyroxene. The manganoan sphene belongs to the assemblage blanfordite-winchite-quartz-sodic plagioclase-microcline-apatite, developed by the interaction of the pegmatite fluid with the manganiferous country rock.

OPTICAL PROPERTIES

The sphenes are developed as well formed wine-red crystals that show, under the microscope, the following scheme of pleochroism:

- α = pale yellow with a greenish tinge
- β = pale pink with greenish tinge

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 γ = salmon pink.

The refractive indices of the mineral are very high. $\alpha = 1.847 \pm .006$. γ could not be measured (due to nonavailability of liquids with n > 1.90) though it is much higher than 1.90. The birefringence, as apparent from interference colour, is also very high. 2 $\dot{V}_{\gamma} = 38^{\circ}$; γ :[001]=45°.

CHEMICAL COMPOSITION

A separated and cleaned sample of sphene was chemically analysed and the results are given in Table 1. The X-ray powder data of the mineral has been given in Table 2.

The manganese content of this sphene is unusually high and it apparently replaces Ca in the structure. The TiO_2 content is slightly low and the Al_2O_3 and Fe_2O_3 content high and these, together with the high value of optic axial angle and relatively

	wt%	No. of ions on the basis of 24(O, OH, F)	
SiO2	29.94	3.87 [0.13]	4.00
Al_2O_3	9.20	[1.26]	
TiO ₂	30.20	2.95	
Fe ₂ O ₃	3.16	0.31	4.63
FeO	0.56	0.06	
MgO	0.30	0.05	
MnO	1.82	ר0.20	
CaO	23.97	3.33	3.63
Na ₂ O	0.23	0.05	
K ₂ O	0.35	0.05	
H ₂ O ⁺	0.42		0.38 OH
$H_2O -$	0.14		
TOTAL	100.29		

TABLE	T X-ray powder data of manganoan sphene, Cu/Ni radiation							
I	d (Å)	1	d (Å)	1	d (Å)	. 1	d(Å)	
4	1.503	2	1.806	w	2.364	5	4.93	
4B	1.421	5VB	1.729	5	2.277	10	3.247	
3	1.35	5	1.645	1	2.113	. 8	3.00	
3	1.308	3	1.561	5	2.071	VW	2.831	
1	1.28	2	1.531	1 .	1.953	10	2.611	

low R. I. (within the range for sphene), indicate that the mineral corresponds to the manganoan grothite variety [DEER, HOWIE and ZUSSMAN, 1963, p. 71].

REFERENCES

DEER, W. A., HOWIE, R. A., ZUSSMAN, J. [1963]: Rock Forming Minerals, vol. 1, Longmans, London, p. 71.

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TABLE 1