SHORT COMMUNICATIONS

Grossular–spessartine garnet from Goldongri, Panchmahal, Gujrat State, India

GARNETS are plentiful in Goldongri manganese mine. A detailed geological account of the mine area has been given by Fermor (1909). Here intensely folded gonditic gneisses, interbanded with calc-silicate rocks and ore bands, have been cut up by a series of apophyses, veins, and pegmatites of a porphyritic biotite granite. In one such apophysis, cutting across an interlayered band of ore and calc-silicate rock, euhedral brownish-red garnet from 3 to 5 mm in diameter has developed together with blanfordite, sphene, and manganapatite, the rest of the rock being composed of intergrown microcline and orthoclase with little quartz.

Whilst the honey yellow spessartine of the calc silicate band is much fractured, xenomorphic, full of inclusions and has n 1·803, the apophysis garnet occurs in well-developed dodecahedral forms, is brownish-red in colour, inclusion-free and has n from 1·770 to 1·776. Thus because of the different colour and paragenesis of the apophysis garnet from that formed in the calc silicate band, it was purified and analysed (table I), and proves to be a grossular–spessartine variety.

TABLE I. Grossular–spessartine analysis

		Numbers of ions on the basis of 24 oxygen			*Molar percentages of end-members*	
SiO_2	37·45	Si	5·884	6·000	Andradite	4·00
TiO_2	Tr.	Al	0·116		Grossular	50·09
Al_2O_3	21·23		3·806	3·957	Spessartine	33·16
Fe_2O_3	1·20	Fe^{3+}	0·151		Almandine	10·78
FeO	4·79	Fe^{2+}	0·631		Pyrope	1·97
MnO	14·41	Mn	1·914	6·118		
MgO	0·60	Mg	0·141			
CaO	20·40	Ca	3·432			
Sum:	100·08					

n 1·770–1·776.
Sp. Gr. 3·82–3·86.

As remarked by Lee (1962), Howie (1965), and Němec (1967), garnets of this type are rare, falling as they do midway between the two dominant garnet series pyralspite and ugrandite.

Literature dealing with such unusual garnets is scanty. However, various parageneses have been proposed. Lee (1962) gives data for garnets from Victory Mine, Gabbs, Nevada, found in a feldspathised granodiorite that was subject to mylonitization. Another example by Lee *et al.* (1963) comes from a glaucophane-bearing rock of metacarbonate type. Howie (1965) believes that such garnets are typical of metasomatic calc-silicate assemblages and garnet–quartz rocks. In the present case, the occurrence of xenoliths of calc-silicate rocks and manganese ore in various stages of digestion and the formation of minerals like blandfordite and manganoan sphene in the granite apophysis clearly indicate that assimilation of calc-manganoan material played an important role in the formation of grossular–spessartine garnet. The assimilation led to a high ratio of manganese and lime to iron and magnesium and thus raised the composition to a garnet-forming level during crystallization.

In conclusion: Boeke's (1914) diagram indicates a broad gap between the grossular–andradite series on the one hand and pyrope–almandine–spessartine on the other, pointing to a restricted miscibility between the two series. Since then garnets falling in this gap have been described. The study of the grossular–spessartine garnets from Goldongri lends support to Němec's (1967) observation that 'though the transitional members between the pyralspite and grandite series occur very sporadically, there exists, under favourable conditions, a perfect miscibility between grossular on the one hand and spessartine or almandine or pyrope on the other'.

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