ON IRON-WOLLASTONITES IN CONTACT SKARNS: AN EXAMPLE FROM SKYE

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The ore skarn zones in the dolomite invaded by the Beinn an Dubhaich granite, Skye, often contain residual chert nodules ("sponge forms") immediately encased by wollastonite not infrequently associated with clinopyroxene. Study of the optical properties of the wollastonites of this encasing zone shows that their composition varies according to the nature of the associated clinopyroxene. Wollastonites associated with strongly coloured clinopyroxene show the optical characters of the artificial iron wollastonites, whereas the wollastonite associated with a colourless diopsidic pyroxene possesses the normal, chemical and optical properties of this mineral. The coloured clinopyroxenes found in the skarn zone are hedenbergite rich solid solutions with green to yellow green pleochroism (γ =yellow green, α=green) more or less strongly marked. The wollastonite (white) is intergrown with these or may form a separate band between two seams of the pyroxene. The remaining mineral found in close association particularly with the pyroxene is a coloured grossular-andradite. From such a skarn the wollastonite and pyroxene have been separated for analysis in order to reveal more precise data of the paragenesis. The separated wollastonite fraction yielded a product of varying specific gravity, the bulk of the material having a value of 3.09. This material provided homogeneous crystals, colourless in transmitted light, with the following optical properties: $\alpha = 1.640$, $\gamma = 1.653$, $2V_\alpha 60° \pm 3°$, $\alpha' \wedge c = 44°$ in section perpendicular to the zone of cleavages. Sections perpendicular to the acute bisectrix gave extinction angles of 5°–6° from the zone of cleavages. Simple twins on $\{100\}$ (old monoclinic orientation). Analysis of such material gave the results set out in the accompanying table. In the separation a small amount of a heavier fraction (Sp. Gr. $>$3.10) showed a maximum value of $\gamma = 1.660$, pointing to still higher contents of iron in solid solution in some of the material. A partial analysis of the associated hedenbergitic pyroxene (Sp. Gr. 3.55) which contained a small quantity of impurity including some fine garnet, gave SiO_2 46.62, Al_2O_3 0.59, Fe_2O_3 1.99, FeO 16.81, MnO 1.04, CaO 24.46, MgO 5.63. If alumina and ferric oxide are removed as grossular-andradite, this pyroxene analysis recalculated gives SiO_2 50.7, FeO 18.5, MnO 1.1, CaO 23.5, MgO 6.2, yielding an approximate composition $Di_{33}Hd_{67}$ (Diopside$_{33}$ Hedenbergite$_{67}$). This is a bulk composition of somewhat variable material. The maximum value of γ re-

	1	mols	metals to 6 Oxygens
SiO_2	50.00	8326	1.99
TiO_2	tr.		
Al_2O_3	—		
Fe_2O_3	nil		
FeO	9.29	1293	0.309
MnO	1.22	172	0.041 } 2.01
CaO	38.86	6929	1.660
MgO	nil		
H_2O	nil		$CaSiO_3$ 80.6%
Insoluble in HCl	0.45		$FeSiO_3$ 17.1
			$MnSiO_3$ 2.3
	99.82		

1. Iron wollastonite in hedenbergite skarn (with some grossular-andradite) Camas Malag, Skye. Analyst H. C. G. Vincent.

corded is 1.742 equivalent to Hd_{76}, the pyroxene as with the wollastonite showing a range of composition around the average of Hd_{67}.

The refractive indices of the analysed wollastonite solid solution accord with the data on artificial iron wollastonites of comparable composition prepared by Bowen and Schairer (1). Material of approximately this composition (20% $FeSiO_3$) could, according to experimental data, be in equilibrium with pure hedenbergite at 500°–600° C. The occurrence of such iron wollastonites in nature serves thus in a measure as a geological thermometer and the preservation of such material at ordinary temperatures may be taken as indicative of the virtual cessation of unmixing at lower temperatures. In the system $CaSiO_3$—diopside, while magnesium wollastonite solid solutions occur at high temperatures, Schairer and Bowen (2) have shown that the form of the unmixing curve is such that below 1000° C. the extent of solid solution is negligible. (See also Osborn (3). The occurrence of *normal* wollastonite* in these skarns where the associated pyroxene is colourless diopside is therefore in harmony with the experimental data. The natural occurrence of iron wollastonite has previously been reported by the writer from the endogenous zone of the dolerite of Scawt Hill (4) and more recently it has been observed in an alkali gabbro from Muck (5). Its development in a granite contact skarn (exogenous) gives reason to believe that solid solutions of this type may be not uncommon in association with hedenbergite in metasomatic contact rocks formed in higher temperature ranges. This same contact zone in Skye shows indeed that it is not limited to the environment now described.

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* Analysis confirms the absence of magnesia.

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