A NOTE ON NEW ANTARCTIC IRON METEORITES

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Abstract: Metallographic properties of newly recovered iron meteorites from Antarctica (Yamato-74044(Pallasite), Yamato-75031, Yamato-75105 and Allan Nunatak No. 2) are very briefly summarized in Table 1.

1. Introduction

Metallographic properties of Yamato-75105 iron meteorite has been described in fair detail by NAGATA *et al.* (1976), and those of Yamato-75031 iron meteorite and the metallic phase of Yamato-74044 pallasite are reported by FISHER *et al.* (1978). These three meteorites are only two irons and one stony-iron among 991 pieces of Yamato meteorite collection, all others being either chondrites or achondrites.

Among eleven meteorites newly recovered from the ice plateau west Trans-antarctic Mountains in West Antarctica in 1976–77, only one (Allan Nunatak No. 2) is an iron meteorite. The three iron meteorites and the metal phase of Yamato-74044 have recently been metallographically re-examined. Results of these studies will be reported in detail later, but this short note briefly summarizes their characteristic key points.

2. Chemical Composition

The bulk chemical compositions of the four samples (the metal phase for Yamato-74044) are summarized in Table 1, where those of two irons and one pallasite previously recovered from Antarctica also are given for comparison (BUCHWALD, 1975). It must be noted in the table that the P content in Yamato-75105 obtained by the present new analysis is considerably larger than that previously reported (NAGATA *et al.*, 1976). The high content of phosphorus in this sample is to be origin of characteristic schreibersite grains of (75% Fe,

Table 1. Chemical composition of Antarctic iron meteorites.

Designation	Weight (gm)	Density (gm/cm³)	Ni	Co (wt/ %)	P
Yamato-74044	51.8	5.083	10.6	0.75	0.1
Yamato-75031	60.2	7.470	15.3	0.76	~1.0
Yamato-75105	17.6	6.868	5.6	0.52	~1.7
Allan Nunatak No. 2	1,510	7.812	7.2	0.6	0.4
	(kg)				
Lazarev	~10		10.05	0.67	0.23
Neptune Mountain	1.07		7.1	—	0.20
Thiel Mountain (pallasite)	31.7		10.1	—	—

10%Ni, 15%P) in composition. The chemical composition of Allan Nunatak iron is well represented by 7.2%Ni kamacite.

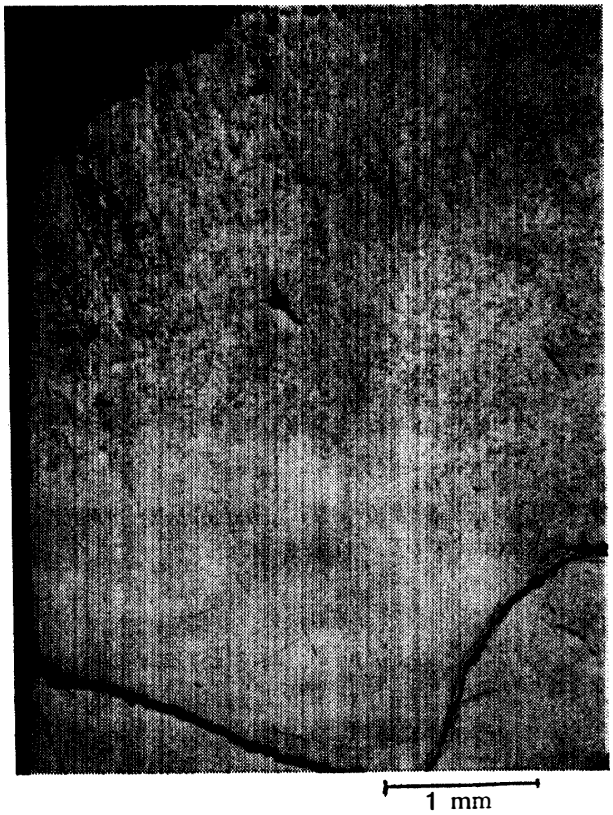

Fig. 1. Cross section surface of Allan Nunatak No. 2. The dark right-upper corner part is the fusion crust. The gray zone of complicated structure between the fusion crust and the unaltered interior is the reheated zone. Neuman lines are clearly observed in the unaltered interior part. A thick dark line represents an oxidized zone.

3. Some Metallographic Characteristics

3.1. Allan Nunatak No. 2

As shown in Fig. 1, the outer part close to the fusion crust of Allan Nunatak No. 2 iron meteorite has been reheated, but the interior is mainly 7.2%Ni kamacite. Observed hardness (100 g Vickers) of this sample is 214 at the reheated rim, while it is 160 at the unaltered interior, indicating that this meteorite was in an almost perfectly annealed state before it reached the terrestrial atmosphere (Type III hardness distribution after BUCHWALD).

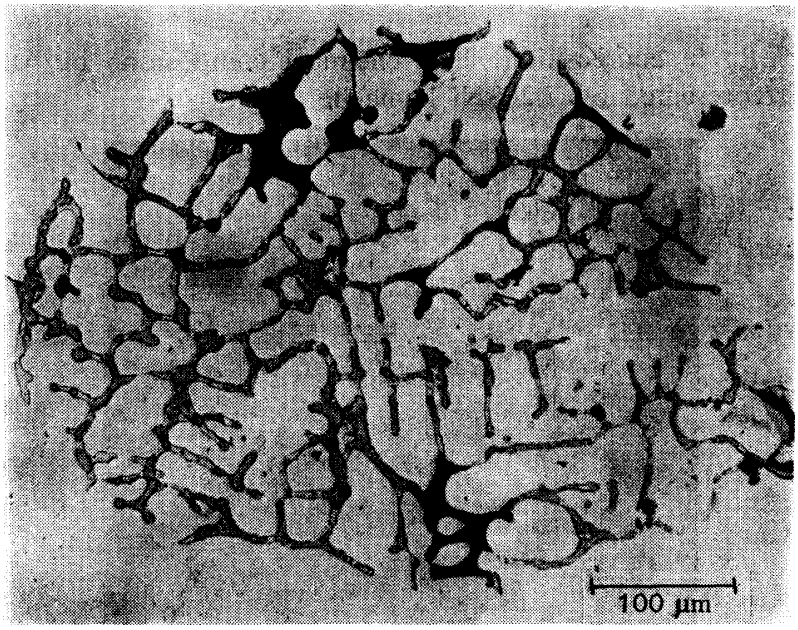

Fig. 2. Eutectic structure of schreibersite, $(Fe, Ni)_3P$, in Yamato-75105.

3.2. Yamato-75105

Schreibersite grains (75%Fe, 10%Ni, 15%P) are enveloped by a phosphorus-rich kamacite zone (91%Fe, 7%Ni, 2%P) in 5%Ni kamacite matrix in the unaltered interior of this iron meteorite. Fig. 2 shows the eutectic structure of a schreibersite grain. The P-rich kamacite zone would be a product of reheating process which results in a resolution of the phosphide.

3.3. Yamato-75031

This iron meteorite contains a high content (15.3%) of nickel and a high content (1.0%) of phosphorus. Therefore, this iron meteorite comprises coarse schreibersite grains, their swathing kamacite (7.5%Ni, 0.2%P) and a large number of fine Widmanstätten kamacite zones in the plessite matrix (16~30%Ni).

3.4. Metal phase of Yamato-74044

In the metal phase of this sample which contains 10.6%Ni, 0.75%Co and 0.1%P, coarse plessite (~20%Ni) grains are enveloped by Ni-rich taenite (27~45%Ni) zones in kamacite (7%Ni) matrix. Metallographic descriptions of Yamato-75031 and Yamato-74044 in more detail can be seen in a separate paper of FISHER *et al.* (1978).

References

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