9149. 3P.

THERMOANALYTICAL CHARACTERIZATION OF SEVERAL ANTARCTIC METEORITES WE054941

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Following our first attempts to get thermoanalytical data for a number of meteorites [cf. Lang et al., 1981] we focused our attention on several meteorites from Antarctica: 5 achondrites, 2 chondrites and 1 iron. Received from the National Institute of Polar Research Tokyo they were:

achondrites :	Yamato-74010, diogenite
	Yamato-74013, diogenite
	Yamato-7308, howardite
	Yamato-74450, polymict eucrite
	ALH-765, polymict eucrite
chondrites :	Yamato-75102, L 3
	Yamato-74662, C 2
iron :	DRP-78007

We realize that our few data [cf. Lang et al., 1983, 1985; Żbik et al., 1984] are too preliminary and scarce to offer any valuable conclusions. The reported here few observations are expected to be useful in the future research of Antarctic meteorites including thermoanalytical study.

The thermochemical response to heating in air is observed distinct on the differential thermal /DTA/ and thermogravimetric /TG/ curves. However, within the heating range up to 1000°C exothermic peaks from oxidation are often seen on the DTA-curves accompanied by a mass increase on the TG-curves. Our experience suggests that in meteorites remarkable oxidation events are due - in the first approximation at least - possibly to iron. Wüstite FeO can be obtained from conversion of free iron or decay of nickel-iron to be further oxidized to magnetite Fe_3O_4 or even hematite Fe_2O_3. The final possible oxidation of free iron to hematite results in mass increase of ~43%. The intermediate steps leading to ultimate oxidation of iron can eventually be seen on the DTA-curves as more or less resolved exothermic peaks.

Assuming an extremely simplified model of oxidation of iron to hematite, covering free iron, nickel-iron and iron sulfides, with TG-data we can estimate the oxidable part of the total iron. The term "oxidable" refers here to temperatures not exceeding 1000°C. We received :

	Y-74013	ALH-765	Y-74450	Y-7308	Y-75102
Fe total wt%	13.77	16.42	15.21	13.45	22.24
mass increase wt%	0.64	1.4	2.6	2.6	2.1
Fe oxidized %%	3.1	6.06	11.42	12.92	6.26

For Derrick Peak-78007 iron the mass increase as low as ~3.5% proves by far incomplete oxidation during heating in air. Similar result was received by us for the Sikhote Alin iron (3.88%).

The effects of oxidation processes can often be better identified by comparing the DTA-curves for heating in air with those as obtained for heating in oxidation-suppressing atmosphere of argon. Unfortunately in the latter case the TG-data were unavailable. Meandering of the DTA-curves is another feature of the applied thermoanalytical techniques making difficult the analysis of the curves.

Thermoanalytical method can be helpful in determining the degree of weathering of meteoritic material. With this purpose it was applied by Gooding [1981] . Weathering results in appearance of mineral forms which at least partially volatilize even at non-elevated temperatures. In the case of the Antarctic meteorites such behavior of meteoritic material is not observed. The thermogravimetric losses are small - they do not differ from those of non-Antarctic meteorites.However, in the case of the Yamato diogenites -74010 and -74013 we analyzed samples stored without any special precaution in test tubes for a couple of years: we obtained thermoanalytical curves remarkably changed [see Lang et al., 1983] . This observation seems to argue that natural conditions in Antarctica where the meteorites were found do not favour significantly their weathering. Naturally, such a conclusion needs further examination of Antarctic meteorites accounting the problem.

A distinct behaviour during heating in air was identified in the case of the Yamato-74662 carbonaceous chondrite C 2. Heated in air it lost rather smoothly ~9.3% of its original mass. We attributed these thermogravimetric losses to joint volatilization of water and carbon compounds. An unique feature of this meteorite is seen on the DTA-curve for heating in argon. The remarkable exothermic peak at 686°C - similar in shape to oxidation peaks - should be referred presumably to formation of a new mineral form possibly of remnants of phyllosilicates affected by heating while being a major component of the original meteorite.

In Fig.1 and 2 are given the thermoanalytical curves for Yamato-74013 diogenite and Yamato-7308 howardite respectively. In Fig.3 is demonstrated the effect of storage of powdered diogenite Yamato-74010 for two years in a test tube. In Fig.4a and 4b are shown the curves for the Yamato-74662 for heating in argon and in air respectively.

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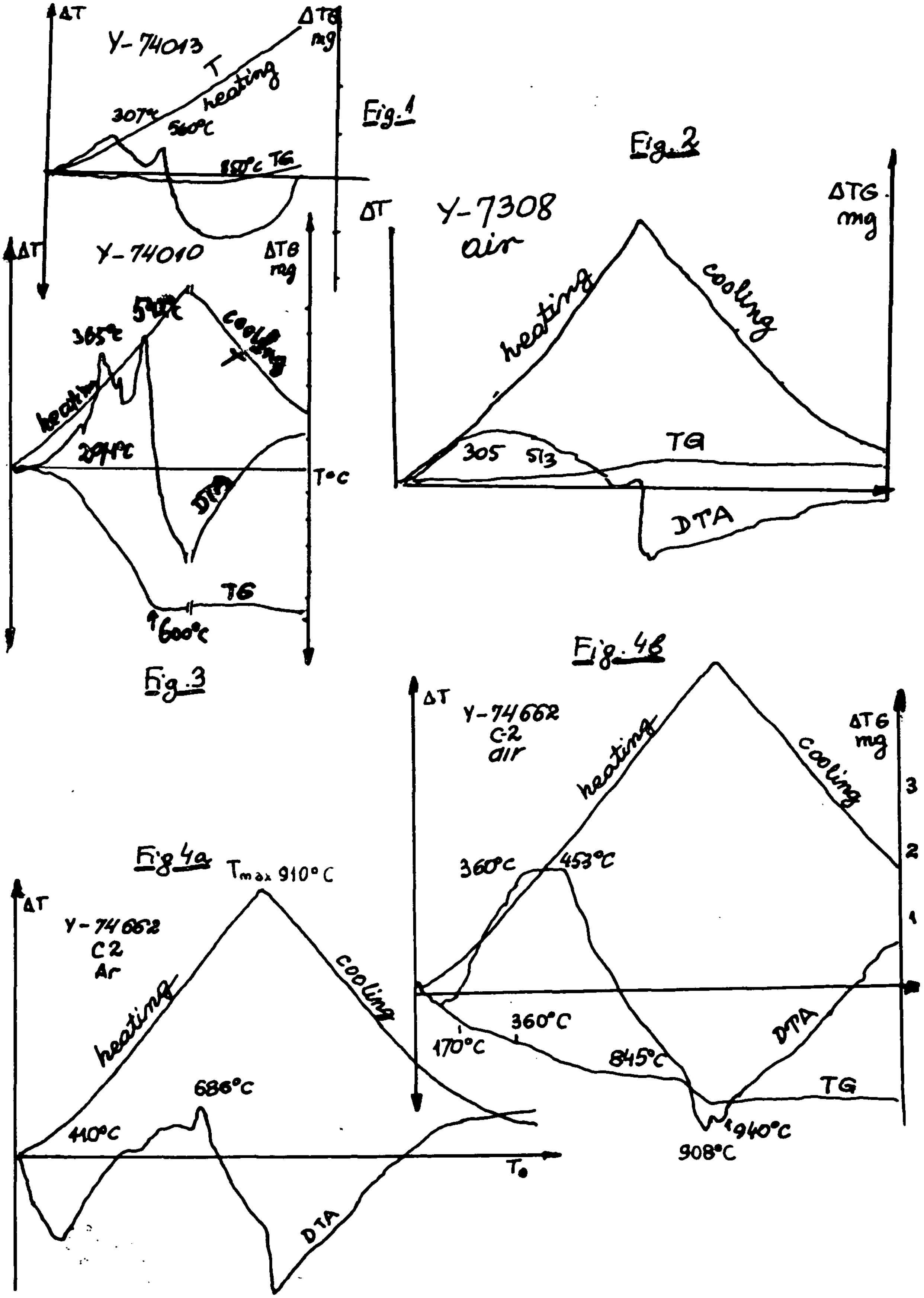
Fig.1
Y-74013
ΔT
ΔTG mg
T
heating
307°C
560°C
850°C TG
Fig.2
Y-7308
air
ΔT
ΔTG mg
heating
cooling
305
513
TG
DTA
Y-74010
ΔT
ΔTG mg
365°C
heating
cooling
294°C
T°C
DTA
TG
600°C
Fig.3
Fig.4b
ΔT
Y-74662
C2
air
ΔTG mg
heating
cooling
3
2
1
360°C
453°C
360°C
170°C
845°C
DTA
TG
940°C
908°C
Fig.4a
Tmax 910°C
ΔT
Y-74662
C2
Ar
heating
cooling
686°C
410°C
T
DTA