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Meteorites and Minerals for Collection, Education and Research

DATE: April 17, 1990

FAX CORRESPONDENCE TO: 49 6131 305 388

Three (3) Pages

Dr. Frank Wlotzka
Editor, METEORITICAL BULLETIN
Max-Planck-Institut fur Chemie
Saarstrasse 23, Postfach 3060
D-6500 Mainz
West Germany

Dear Sir:

We are pleased to provide a completed information form about a new and unique carbonaceous chondrite which we have recently acquired. It has taken considerable time to get the necessary work done on this specimen and I will be providing a photograph in the near future.

Please acknowledge at your convenience.

Sincerely,

David New

4-17-90
5:25

INFORMATION REQUIRED FOR A NEW METEORITE

Proposed name of meteorite: Maralinga FIND Fall or Find

Note: Meteorites can be named after any permanent landmarks (*e.g.*, towns, brooks, sinkholes, etc.). Please list the type of feature used for this meteorite name (provide map, if possible): Map attached

Fall date and local time, or find date: 1974 Recognized 1989

Nearest town or village: Maralinga County:

State: South Australia Country: Australia

Geographical Coordinates: 30 ° 18 . South ' N or S 131 ° 16 . East ' E or W

Total recovered mass: 3.38 kg

Number of individual objects recovered and their masses: One

Circumstances of recovery of fall or find (*e.g.*, found during ploughing by Alex Brown, or recovered by Alice Green after a sonic boom was heard): Discovered by a prospector

Nature of recovery site: (*e.g.*, rice paddy; forest; grain field; house): Sandy ridge

Classification: (*e.g.*, H5 chondrite; eucrite; IIIAB iron): C5

Name of person who classified meteorite: Dr. Carleton B. Moore

Name and address of institution where the section or sample used for classification has been deposited:
Center for Meteorite Studies
Arizona State University
Tempe, Arizona 85287

Name and address(es) of institution(s) where most material is now located:

Key classificational information (*e.g.*, FeO/(FeO + MgO) in olivine for a chondrite; concentrations of Ni and Ga for an iron):

Fa 32.9 to 34.6 Average 33.4

Name of analyst:

Remarks on any unusual mineralogical, chemical or physical properties:

If the meteorite is a find, has another meteorite with the same classification been recovered within a distance of 25 km? If yes, summarize the evidence that the new meteorite is not paired with the one recovered previously: No

Name and address of person who filled out this form: David New
P. O. Box 278
Anacortes, Washington 98221 U.S.A.

If there is insufficient space for your report in any of the above sections, please use the back of this form or a separate sheet.

Mail to:

Dr. Frank Wlotzka, Editor of **Meteoritical Bulletin**
Max-Planck-Institut für Chemie
Saarstrasse 23, Postfach 3060
D-6500 Mainz
Federal Republic of Germany

MARALINGA - A NEW METAMORPHOSED CARBONACEOUS CHONDRITE; T. Geiger [1] and B. Spettel [2]. [1] University of Münster, Institute of Planetology, Wilhelm-Klemm-Str.10, 4400 Münster, Germany; [2] Max-Planck-Institut für Chemie, Saarstr.23, 6500 Mainz, Germany.

The Maralinga meteorite is a new carbonaceous chondrite find from Australia (found 1974). It has been recently classified as petrologic type 5 by C.B. Moore (University of Arizona). Since many new meteorites are collected in Antarctica 27 meteorites were classified as type 4-6 carbonaceous chondrites. It is now possible to reveal a systematic study among the members of this group. The problems to classify these meteorites after the classical classification schemes, e.g. mineralogy and petrography, bulk chemistry, and oxygen isotopic data are now obvious. Geiger & Bischoff (1) therefore recommended to establish a new carbonaceous chondrite group, as also suggested by Kallemeyn et al. (2). Maralinga is probably another member of this new meteorite group.

Here we report first petrographic and mineralogical data, as well as the first bulk chemical analysis of Maralinga. A piece of 11 g was examined visually. Polished thin sections were made and general petrographic investigations were carried out using transmitted and reflected light techniques. Mineral analyses were performed by using an electron microprobe and a scanning electron microscope equipped with an EDS-system.

General petrography: Maralinga is moderately affected by weathering. Some minerals, especially chondrule surrounding silicates and magnetites as well as the fusion crust show a brown staining (iron oxides). Chondrules and fragments are well distinct from matrix minerals. Size measurements of 35 chondrules gave a mean apparent diameter of about 1 mm ranging from 0.3 to 1.8 mm . The matrix of Maralinga is largely composed of olivines (20-50 μm) intergrown with plagioclase up to 100 μm in size and pyroxenes (10-50 μm). All phases are decorated with micron-sized magnetites. Opaque minerals are mainly magnetite and small amounts of fine-grained pentlandite. We could also find two small particles (3 μm) of (Os, Ru, Ir)S_2, which were described by (3) in some other C4-6 chondrites. Magnetites occur in two populations: large, rounded aggregates up to some hundred microns in size and small micron and sub-micron sized particles decorating silicate minerals. All large magnetites contain exsolution features as reported by (4) for some other members of the type 4-6 carbonaceous chondrites group.

Mineral chemistry: The matrix-olivines are highly equilibrated. Mean Fayalite-content is 33.9$\pm$0.4 mole%. They also contain various amounts of NiO (mean 0.57$\pm$0.08 wt.%; range 0.38-0.82 wt.%) and CaO (mean 0.19$\pm$0.18 wt.%; range 0.0-0.67 wt.%). The high NiO-contents are typical for "oxidized" C4-6 chondrites. Binns et al.(5) and Geiger & Bischoff (6) report Ni containing matrix-olivines in Mulga (West), and ALH82135, ALH84038, ALH85002, and Karoonda, respectively. Low Ca contents of matrix-olivines are also reported by (7) for Karoonda, ALH82135, and PCA82500. These authors concluded that this is due to metamorphism. The pyroxenes are mainly clinopyroxenes - only two orthopyroxenes were found (Fig. 1). Clinopyroxenes are uniform in composition and the orthopyroxenes have Fs contents of 26.0 and 28.8 mole %. This is a very typical value for members of this group, because (6) report similar ortho-pyroxenes in previously investigated meteorites of this group. Another similarity to these samples is the wide distribution of plagioclase compositions. Plagioclases in Maralinga vary from An 35 to An 83 (Fig. 2)

Bulk chemistry: The bulk composition was determined by instrumental neutron activation analysis (INAA). In Table 1 the result is compared to some other members of the C4-6 chondrites group. Except for low Na, Co, Ni, Zn, and Se values Maralinga is - concerning the bulk chemistry - closely related to these C4-6 chondrites

Conclusion: The Maralinga carbonaceous chondrite is after petrographic and mineralogical features and in bulk chemistry very similar to all "oxidized" C4-6 chondrites. This is an additional evidence to group these meteorites in an own carbonaceous chondrite group!

References: (1) Geiger T. & Bischoff A., 15th Symp. Antarctic Met., 78-80, (1990); (2) Kallemeyn et al., GCA, 54, (submitted), (1991); (3) Geiger T. & Bischoff A., LPSC XX, 335-336, (1989); (4) Geiger T. & Bischoff A., LPSC XXI, 409-410, (1990); (5) Binns R.A. et al., Meteoritics 12, 179, (1977); (6) Geiger T. & Bischoff A., Meteoritics 24, 269, (1989); (7) Scott E.R.D. & Taylor G.J., Journ. Geophys. Res. 90, C699-C709, (1985); (8) Kallemeyn G.W. & Wasson J.T., GCA, 46, 2217-2228, (1982); (9) Kallemeyn G.W., Mem. Natl Inst. Polar Res., Spec Issue, 46, 151-161, (1987).

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Table 1: Chemical composition of Maralinga (1), Y-693 (2), ALH82135 (3), Karoonda (4), PCA82500 (5)

	1	2	3	4	5		1	2	3	4	5
Na	2730	3160	3270	3080	3130	Ge	4.8	5.7	5.6	5.4	5.4
Mg	13.7	14.3	14.4	15.2	13.9	As	1.46	1.67	1.32	1.32	1.04
Al	1.24	1.58	1.55	1.67	1.51	Se	1.54	9.0	8.0	7.3	7.5
K	342	317	302	324	234	Br	1.43	0.6	0.4	0.7	0.4
Ca	1.93	1.90	1.75	1.77	1.51	Ru	1400	1250	1000	1180	953
Sc	11.2	11.0	8.8	10.9	8.2	Sb	64	73	75	74	51
V	77	97	97	100	94	La	390	483	405	435	349
Cr	3580	3830	3240	3770	3210	Sm	276	298	240	271	214
Mn	1296	1450	1440	1430	1340	Eu	96.3	115	100	110	89
Fe	23.6	24.0	21.5	24.2	21.8	Yb	300	311	275	308	242
Co	353	751	618	681	504	Lu	44	47	42	46	36
Ni	0.399	1.43	1.21	1.38	1.05	Os	990	960	820	880	715
Zn	65	107	98	91	72	Ir	850	920	757	838	620
						Au	75.6	120	559	136	138

Values for Mg, Al, Ca, Fe, Ni in %; for Na, K, Sc, V, Cr, Mn, Co, Zn, Ge, As, Se, Br, Ru, in ppm; for Sb, La, Sm, Eu, Yb, Lu, Os, Ir, Au in ppb. Data for 2, 3, 5 from Kallemeyn (1987) (9), 4 from Kallemeyn & Wasson (1982) (8).

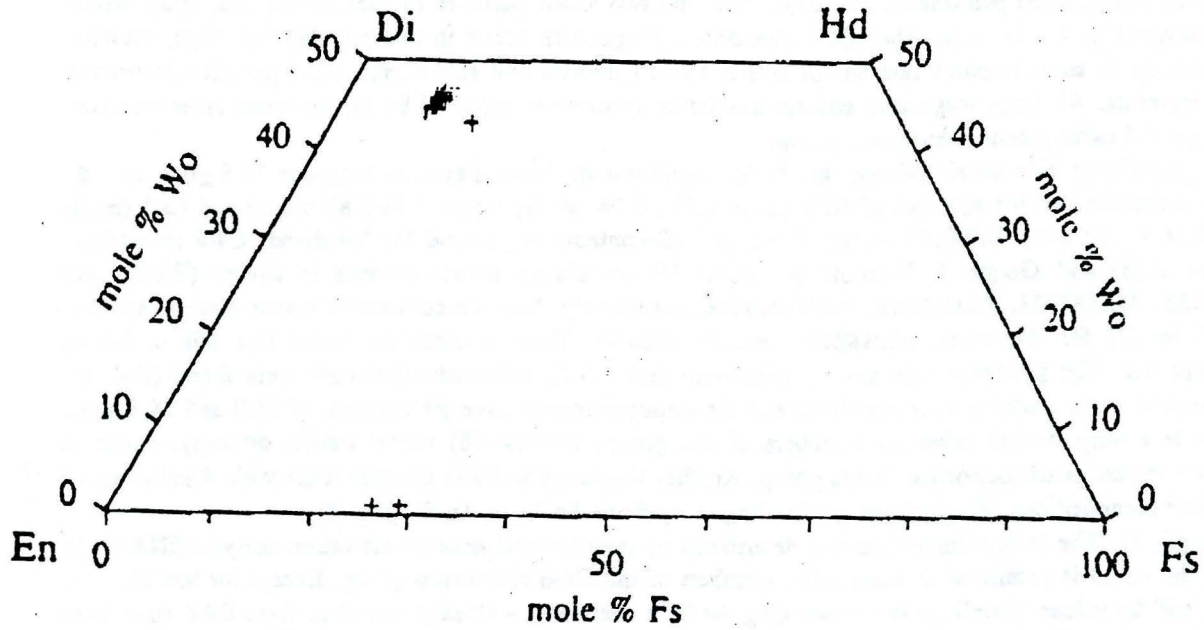

Fig. 1: Composition of pyroxenes in the matrix of Maralinga

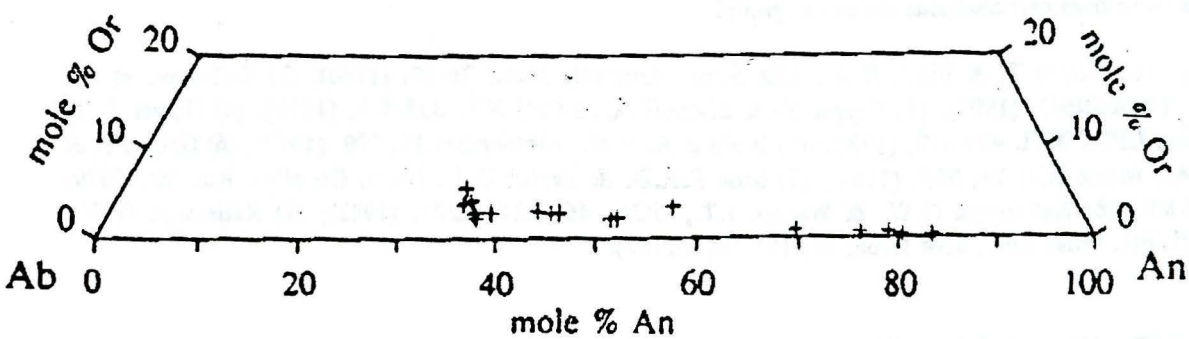

Fig. 2: Composition of plagioclase grains in the matrix of Maralinga