PETROLOGY AND COMPOSITIONAL TRENDS IN FIVE NEW ANTARCTIC DIOGENITES, John L. Berkley, Dept. of Geosciences, SUNY, College at Fredonia, N.Y. 14063.

Introduction This paper reports on the petrography and phase chemistry of five, unique Antarctic diogenites (EET79002, TIL82410, EET83246, EET83247, ALH84001) that fill compositional gaps between previously reported diogenites (1,2). 84001 is emphasized as it displays well-preserved primary textures. ALH77256 was also analyzed for interlaboratory comparisons.

Petrography All samples are dominated by Fe-bearing orthopyroxene with minor Cr-spinel (Table 1). Feldspar (An_{55}) and rare phosphate (apatite) were analyzed in 84001, and minor silica occurs in 79002. Metal occurs as kamacite, but 82410 has both kamacite and taenite (52 wt.% Ni). Ni and Cr in metal and troilite are lowest in 77256 reflecting low values in both spinel and pyroxene. With exception of 84001 and 77256, all samples are highly brecciated. 83246 is notable in showing evidence for post-shock coarsening of matrix material. However, 84001 is rare among diogenites in showing well-preserved, pre-shock textures. Section 84001,6 has granoblastic textures (annealed cumulate) with postcumulus plagioclase. Euhedral Cr-spinel crystals (some with marginal Fe-enrichment) are included within orthopyroxene grains (up to 5 mm dia.) or concentrated along grain boundaries. Olivine, previously reported in 77256 and 79002, was not observed in any section.

Orthopyroxene Application of present analyses to Cr-Al groups of (2,3) show overlap between groups I and II when all individual analyses are plotted (Fig. 1). 77256 apparently forms a separate group although this is disputed by (3). The apparent continuous trend from high Al-high Cr (high-T) to low Al-low Cr (low-T) may be due to inclusion of postcumulus pyroxene analyses in brecciated samples. However, pyroxene in 84001 (all cumulus) shows that even equilibrated diogenite pyroxene may show significant range in Cr-Al, sufficient to bridge the gap between groups I and II (Fig. 1).

Cr-Spinel Spinel shows correlation of Mg with Al (Fig. 2) and Cr with Fe (Fig. 3) as described by (2) but addition of new data introduces complexities. Temperature dependent fractionation should produce a positive Fe-Cr correlation, highest Cr-Al values representing lowest equilibration temperatures. However, 84001 shows a strong negative Fe-Cr correlation superimposed within the larger diogenite trend, also developed to a certain extent in 83247, 79002, and 77256 (Fig. 3). This negative trend may reflect progressive Cr depletion with fractionation in the parent liquid, although other interpretations are possible.

Discussion This suite of diogenites (including 77256) reflects a range of formation temperatures from high (77256) to low (all others). Based on data from Figs. 2 and 3, 83247 and 82410 represent lowest T assemblages, 83246 and 79002 somewhat higher. 84001 is problematic in that it does not fit easily into established diogenite trends. However, low-T for 84001 is indicated by low Al-Cr in OPX (Fig. 1), low Mg-Al but high Cr-Fe in spinel (Figs. 2,3), Ab-rich indigenous plagioclase, and high

Ti in both pyroxene and spinel (Table 1; high for diogenites).

Classification of this suite according to method of (2,3) assigns 82410 and 83247 to grp. I, others to grp. II except 84001 which straddles the boundary (Fig. 1). Future, more detailed analysis of 84001 and other, yet uncollected, low-shock Antarctic diogenites, should contribute to understanding pre-brecciation history of diogenites in general.

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References

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Table 1. Microprobe analyses of Antarctic diogenites (wt.%)

PYROXENE	77256	84001	79002	83247	82410	83246
SiO2	54.81	53.59	54.73	54.49	54.64	54.37
TiO2	0.13	0.15	0.10	0.07	0.05	0.08
Al2O3	1.04	0.81	0.83	0.59	0.50	0.06
Cr2O3	0.28	0.36	0.71	0.81	0.49	0.78
FeO	14.96	17.79	15.02	15.77	16.28	16.49
MnO	0.51	0.49	0.50	0.53	0.54	0.58
MgO	28.06	24.89	27.31	27.02	27.25	25.91
Na2O	ND	0.02	ND	ND	ND	ND
Total	99.80	99.58	100.35	100.09	100.00	100.58
Wo	2.42	3.31	2.26	1.98	1.80	3.03
Fs	23.17	27.88	23.05	24.18	24.63	25.81
SPINEL						
SiO2	ND	0.04	0.16	0.15	0.09	ND
TiO2	0.91	2.18	0.81	0.72	0.80	0.84
Al2O3	21.55	9.28	11.31	9.53	8.92	12.29
Cr2O3	44.55	49.40	54.28	55.66	55.99	51.73
FeO	28.11	33.74	28.72	28.89	30.37	31.01
MnO	0.48	0.47	0.54	0.57	0.58	0.58
MgO	6.48	4.33	3.47	3.13	2.86	2.70
CaO	0.01	0.01	0.06	ND	0.03	0.02
Total	100.09	99.43	99.33	98.65	100.44	99.17

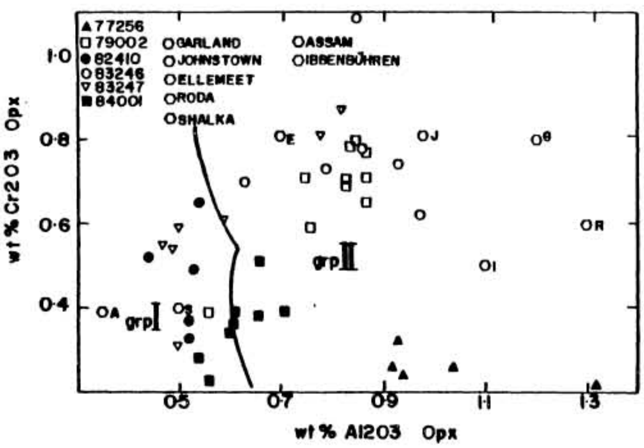

Fig. 1

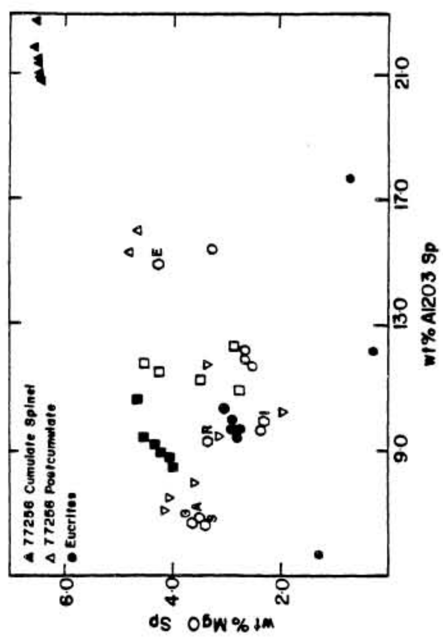

Fig. 2

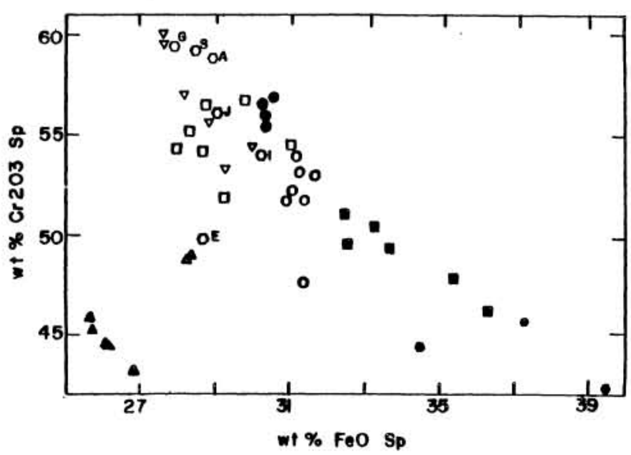

Fig. 3