A UNIQUE EUCRITE CLAST FROM THE KAPOETA HOWARDITE; Aurora Pun, Dept. of Geology, Institute of Meteoritics, Univ. of New Mexico, Albuquerque, NM, 87131; Klaus Keil, G. J. Taylor, Planetary Geosciences Division, Dept. of Geology and Geophysics, SOEST, Univ. of Hawaii at Monoa, Honolulu, HI 96822; and Elbert King, Dept. of Geosciences, Univ. of Houston, Houston, TX, 77004.

Detailed studies of the Kapoeta howardite has revealed a eucrite clast that will extend the present compositional range of eucrites. This clast is characterized by high bulk TiO_2 (2.0 wt %), but normal mg* (.40). It may have formed by a very small degree (~1%) of partial melting in the eucrite parent body.

The mineral phases found in this unequilibrated eucrite are pigeonite, ferroaugite, plagioclase, quartz, ilmenite, troilite, olivine and Fe,Ni metal. Modal abundances and bulk compositions are listed in Table 1. Crystallization involved the simultaneous growth of pigeonite, plagioclase and quartz. Quartz is found as laths (up to .2mm x 1.5mm) and as subhedral grains throughout the clast as well as in the mesostasis. The pigeonites are zoned ($Wo_5En_{64}Fs_{31}$ to $Wo_{24}En_{23}Fs_{53}$) , and contain all of the minor Fe-rich olivine (Fo_{20} to Fo_{24}), which occurs as veinlets throughout the grains. Normal zoning in the pigeonites occurs as Fe and Ca increase from the core to the rims of the grains, while Mg decreases. Titanium contents in these pigeonites are low in the cores and increase towards the rims, with decreasing Mg/(Mg+Fe). Plagioclase ($Or_{18}Ab_4An_{78}$ to $Or_{.3}Ab_{7.7}An_{92}$) occurs primarily as twinned laths both ophitically enclosed in the pigeonites and subophitically throughout the clast. The mesostasis is similar to that found in Y75011,84 (1,2). Ferroaugites ($Wo_{34}En_{21}Fs_{45}$ to $Wo_{37}En_{19}Fs_{44}$) are found in the mesostasis along with ilmenite, troilite, metallic Fe,Ni and quartz. The ilmenite, troilite, and Fe,Ni metal are intergrown. Much of the troilite and metal is found in the boundary regions of the pigeonites, where they are in contact with the mesostasis.

The texture of the clast showing the intimate intergrowth of pigeonite, plagioclase and quartz suggests that the clast crystallized at the eutectic in the system Ol-SiO_2-An. The clast has high TiO_2 and low FeO contents compared to an average of 25 monomict non-cumulate eucrites (Table 1), (3, Table 7). The mg* is .40, similar to the average eucrite. Oxygen isotopic values for this clast are $\delta^{18}O = +3.83$ ‰ and $\delta^{17}O = +1.78$ ‰, which is exactly in the normal eucrite field (4). This clast does not fall near the primary groups of eucrites in the plot of TiO_2 variation as a function of Mg/(Mg+Fe). Adopting the figures from (5,6,7), where TiO_2 is plotted against mg*, it appears that this eucrite clast can be produced by a very small degree of partial melting in the eucrite parent body. This clast follows the partial melting track of 1, based on the observed experimental fractionation trend from (8), as well as track 2, a partial melting track calculated from (9) using La and source regions with Fe/(Fe+Mg) of .35. The composition can also be reproduced by 1% partial melting of the eucrite parent body composition proposed by (7), which is illustrated by the EPB2 curve in (5). This eucrite clast is too rich in Ti to plot on fractional crystallization trends A or B (10). If this interpretation is correct, this Kapoeta clast should be enriched in incompatible trace elements. We plan to measure the REE abundances in this clast.

In conclusion, this unique eucrite clast may be regarded as a primary magma and represents a eucritic liquid with compositions at or near the eutectic in the Ol-SiO_2-An psuedoternary, produced by very small degrees of partial melting.

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TABLE 1

Mineral Phase	Mode (vol%)	Oxide	Bulk Composition[1] (wt %)	Avg. 25 Mnc Eucrites[2] (wt%)
Quartz	19.0	SiO_2	52.5	49.4
Plagioclase	40.9	TiO_2	2.0	0.7
Pigeonite	30.6	Al_2O_3	13.3	12.5
Ferroaugite	3.1	Cr_2O_3	0.24	0.34
Troilite	3.0	FeO	14.3	19.0
Ilmenite	2.4	MnO	0.41	0.53
Fe,Ni metal	0.34	MgO	5.3	6.6
Olivine	0.68	CaO	9.9	10.3
		Na_2O	0.52	0.44
		K_2O	0.06	0.04
		S	0.84	--
		Total	99.37	99.85
			mg* =.40	mg* = .38

[1] Calculated by combinations of modes with electron microprobe analyses of individual phases. Less than 0.5% of Fe,Ni metal was ignored and compositions of troilite and quartz were calculated.

[2] Mnc defined as monomict non-cumulate eucrites, adopted from Table 7 in (3).

mg* defined as molar Mg/(Mg+Fe)