15125 PORPHYRITIC SPHERULITIC QUARTZ-NORMATIVE MARE BASALT ST. 2 6.5 g

INTRODUCTION: 15125 is a pyroxene-phyric basalt belonging to the quartz-normative group. The pyroxenes are so pale-colored that in PET they were misidentified as plagioclase. The sample is medium dark gray; its groundmass is fine-grained but not glassy. The basalt is tough, with no obvious vugs but the surface has some zap pits. 15125 was collected as part of the rake sample 5 m east of the boulder at Station 2 (see Fig. 15105-2).

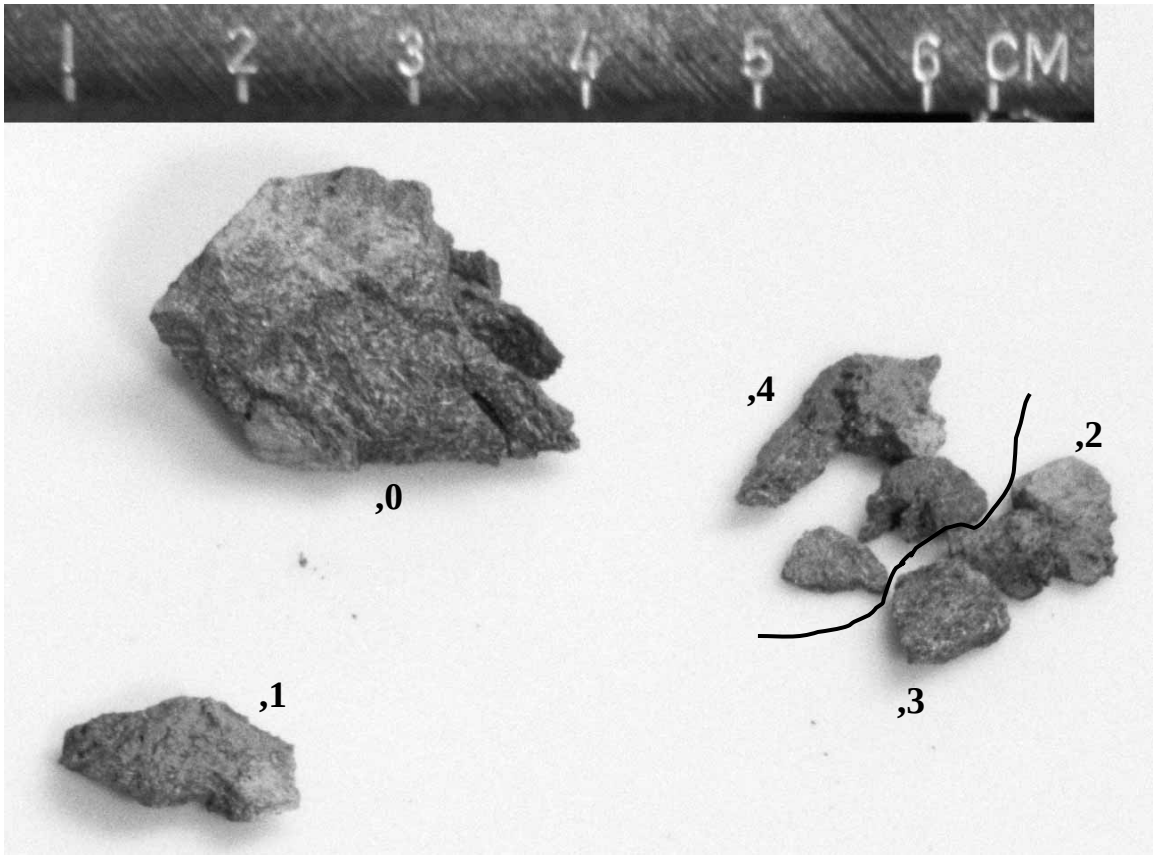

Figure 1. Post-split view of 15125. S-71-55548

PETROLOGY: 15125 is pyroxene-phyric with generally small, skeletal, euhedral, and strongly zoned pyroxenes in a fine, dark, but wholly crystalline groundmass (Fig. 2). It was described by Dowty et al. (1973a, b; 1974) with microprobe analyses of silicates and metals in Dowty et al. (1973c). Opaque mineral analyses were reported by Nehru et al. (1973, 1974). Dowty et al. (1973a, b) reported a mode of 44% pyroxene, 4% olivine, 0.4% opaque minerals, and 51.6% groundmass. Grove and Walker (1977) found 45.3% pyroxene, 3.10% olivine, 0.2% opaque minerals, and 51.4% groundmass. The olivines are skeletal and about the same size as the pyroxene phenocrysts; their compositions range from Fo_{70} to fayalitic (Fig. 3). The pyroxene zoning trends were described by Dowty et al. (1974) (Fig. 4). The phenocrysts (0.5 to 2.0 mm x 0.08 to 0.19 mm) are smaller than groundmass pyroxenes in many coarse-grained quartz-normative basalts. The groundmass consists of spherulitic alternating plagioclase and pyroxene needles in a feathery arrangement. Groundmass pyroxenes are 0.02 to 0.07 x 0.005 mm. Dowty et al. (1974) reported cell parameters for pyroxene, and found the for pigeonite-augite intergrowths to be 1.6, consistent with very fast cooling. Nehru et al. (1974) found that chromite had a more restricted range of Fe/Mg than most other samples; ulvospinel was too small to analyze.

Lofgren et al. (1975) compared the textures of 15125 as described by Dowty et al. (1973a, b) with the products of dynamic experiments on a synthetic quartz-normative basalt composition. They inferred cooling rates of around 5°C/hour for the phenocrysts and more than 30°C/hour for the groundmass. Grove and Walker (1977) used a similar but more sophisticated method to investigate cooling rates. The high pyroxene nucleation (10.7 phenocrysts/ mm^2) corresponds with cooling at about 30°C/hour for the early stages. An integrated rate of about 10°C/hour was inferred from the total phenocryst sizes, and a late stage rate of 85 to 250°C/hour was inferred from plagioclase sizes. The final cooling rates correspond with a distance of about 6 to 9 cm from a conductive boundary.

CHEMISTRY: The analysis of Helmke et al. (1973) is of an average member of the quartz-normative mare basalt group (Table 1). The rare earths are shown in Figure 5. Helmke et al. (1973) postulate two groups of quartz-normative basalts on the basis of Sm/Eu ratios; 15125 was similar to vitrophyre 15597. The defocussed beam analysis (Table 2) is in reasonable agreement with the analysis of Helmke et al. (1973).

PROCESSING AND SUBDIVISIONS: 15125 was chipped to produce daughters ,1 to ,4 (Fig. 1). Thin sections ,6 and ,7 were made from ,1. ,0 is now 4.9 g.

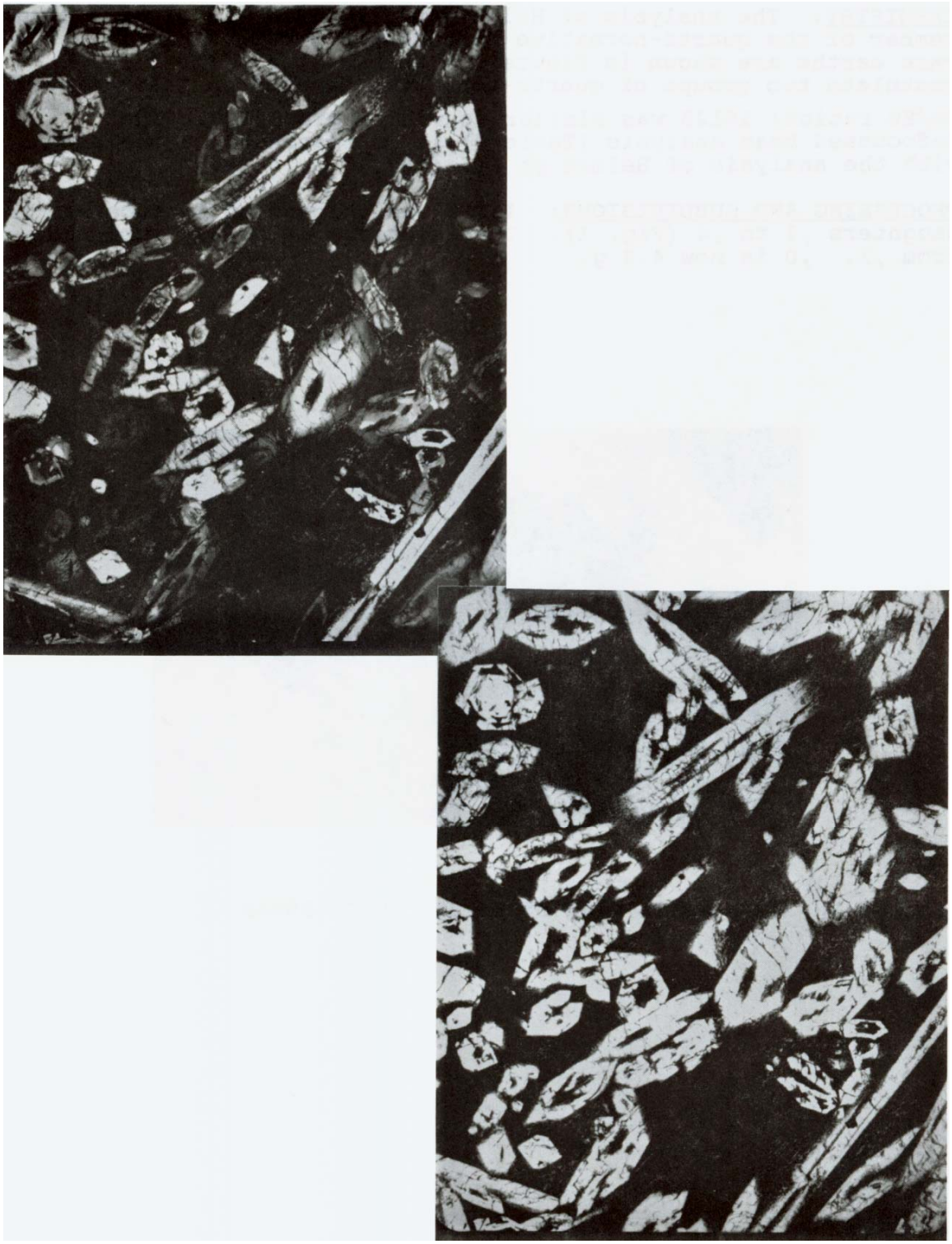

Figure 2. Paired photomicrographs of 15125,7;
left, crossed polarizers; right, plane transmitted light.
Widths about 1.25 mm.

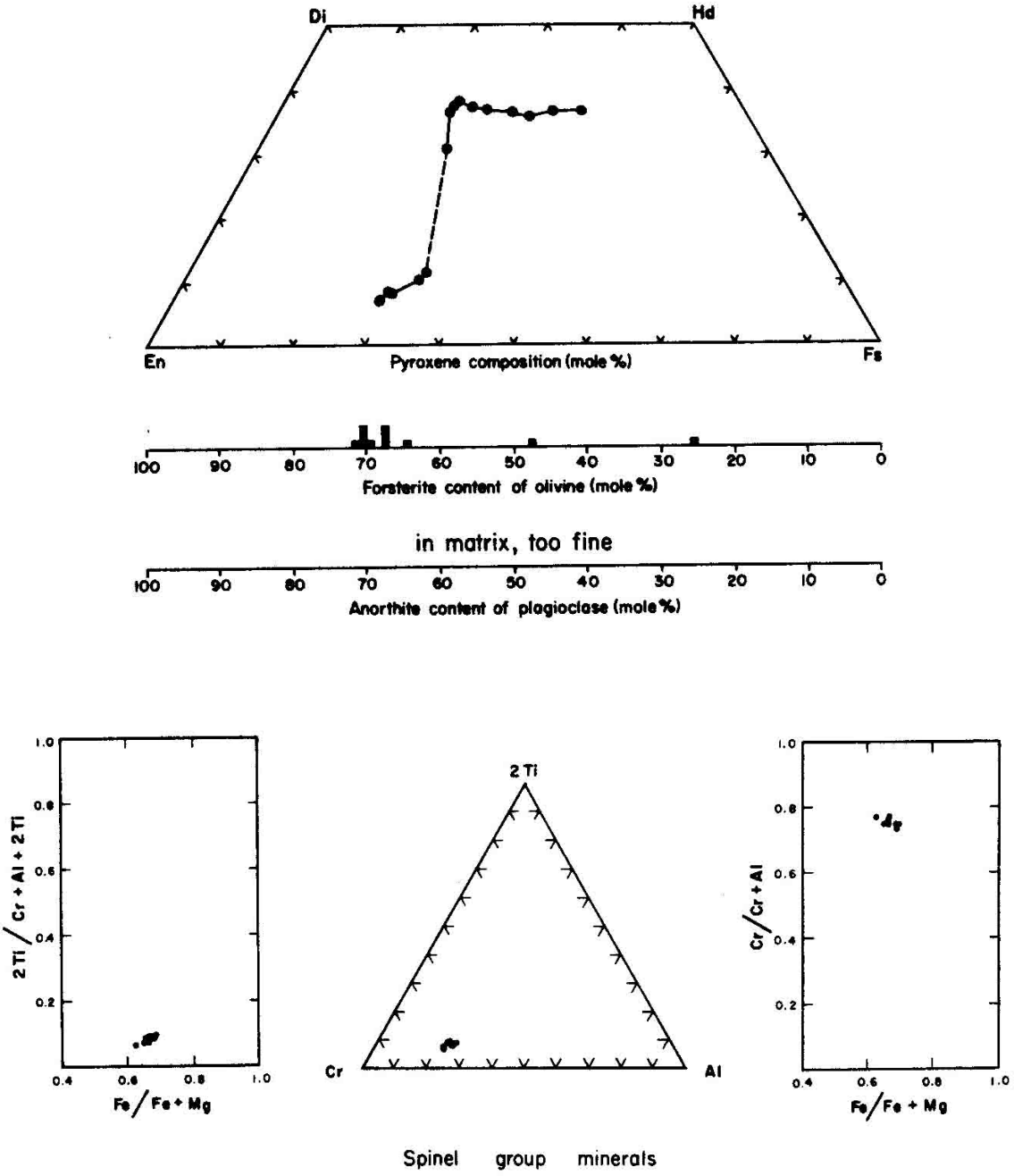

Figure 3. Mineral analyses (Dowty et al., 1973b).

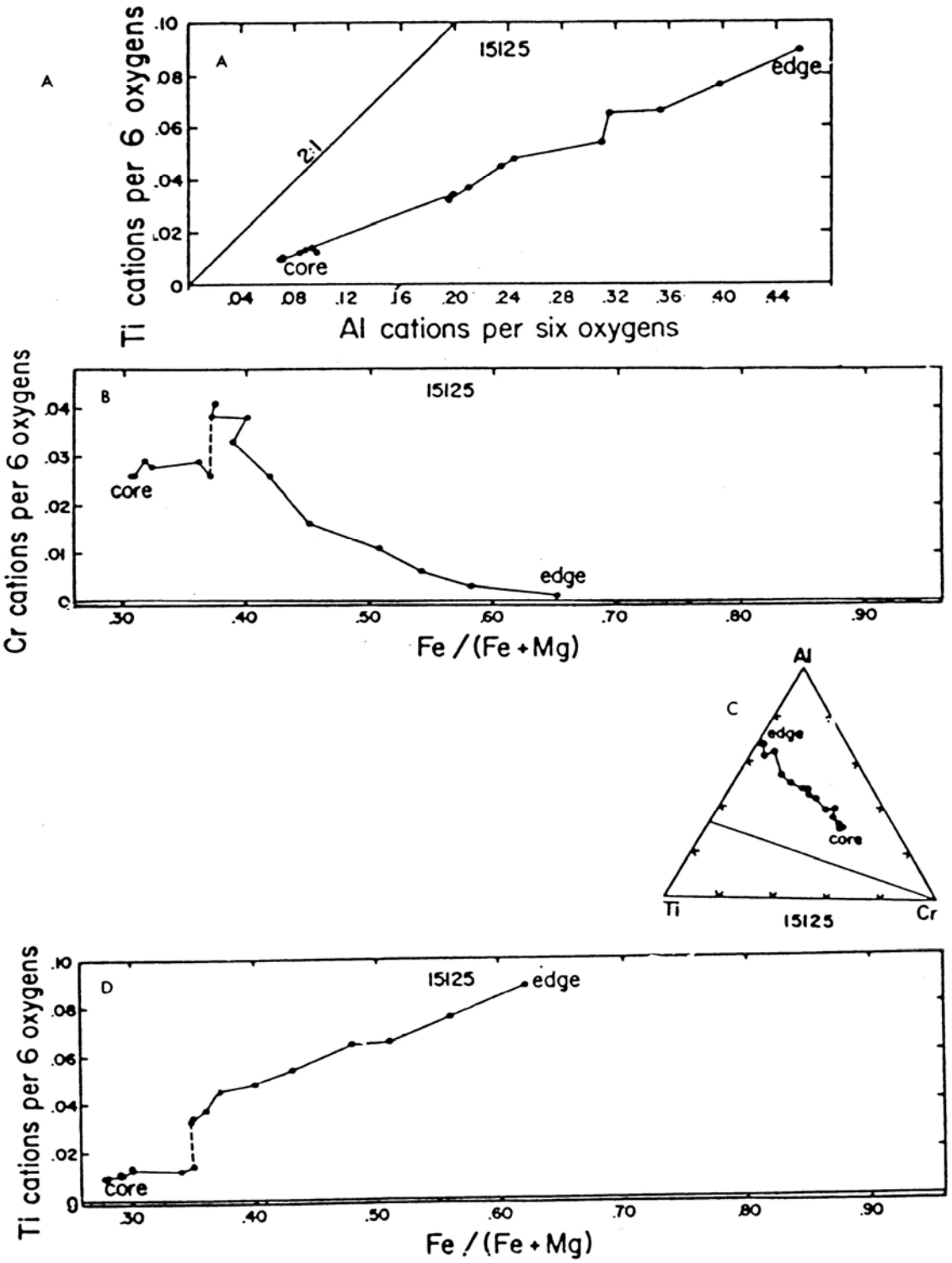

Figure 4. Phenocryst zoning trends,
a) Ti-Al; b) Cr-Fe/(Fe+Mg); c) Ti-Al-Cr; d) Ti-Fe/(Fe+Mg)
(Dowty et al., 1974).

TABLE 15125-1. Chemical analyses

		,3
Wt %	SiO2	48.4
	TiO2	1.80
	Al2O3	9.11
	FeO	20.3
	MgO	9.19
	CaO	8.04
	Na2O	0.351
	K2O	0.053
	P2O5	
(ppm)	Sc	41.5
	V	
	Cr	4140
	Mn	2080
	Co	53
	Ni	
	Rb	0.8
	Sr	
	Y	
	Zr	
	Nb	
	Hf	2.1
	Ba	
	Th	
	U	
	Pb	
	La	5.75
	Ce	17.1
	Pr	
	Nd	11.7
	Sm	3.92
	Eu	1.12
	Gd	5.1
	Tb	0.87
	Dy	6.00
	Ho	1.02
	Er	3.2
	Tm	
	Yb	2.59
	Lu	0.39
	Li	
	Be	
	B	
	C	
	N	
	S	
	F	
	Cl	
	Br	
	Cu	
	Zn	<5
(ppb)	I	
	At	
	Ga	3300
	Ge	
	As	
	Se	
	Mo	
	Tc	
	Ru	
	Rh	
	Pd	
	Ag	
	Cd	
	In	
	Sn	
	Sb	
	Te	
	Cs	20
	Ta	
	W	
	Re	
	Os	
	Ir	
	Pt	
	Au	
	Hg	
	Tl	
	Bi	
		(1)

References and methods:

(1) Helmke et al. (1973); INAA, RNAA, atomic abs.

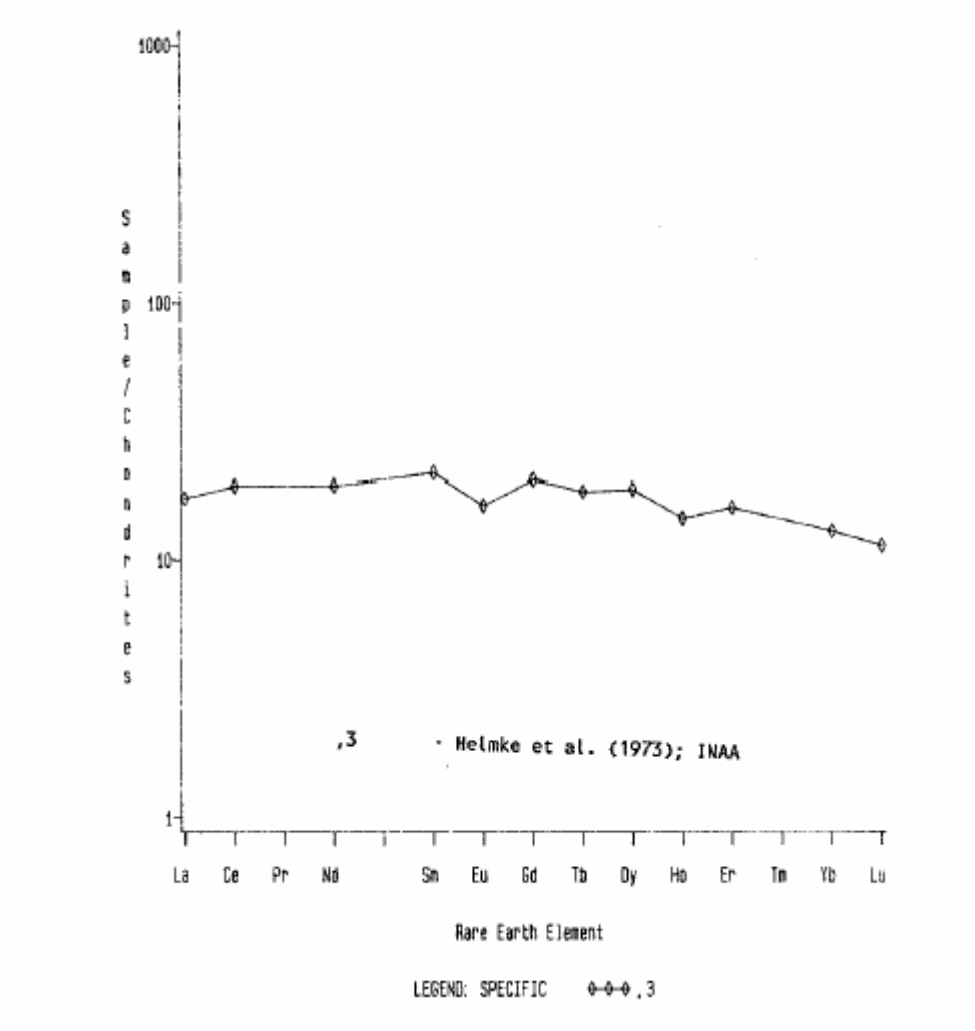

Figure 5. Rare earths in 15125.

TABLE 15125-2. Microprobe defocussed beam analyses
(Dowty et al., 1973a, b)

Wt %	SiO2	47.5
	TiO2	2.27
	Al2O3	8.3
	FeO	22.3
	MgO	9.4
	CaO	9.3
	Na2O	0.33
	K2O	0.05
	P2O5	0.08
ppm	Cr	3700
	Mn	2090