14074 – 5.2 grams
14077 – 2.77 grams
14078 - 8.3 grams
14079 – 3.17 grams
KREEP Basalt

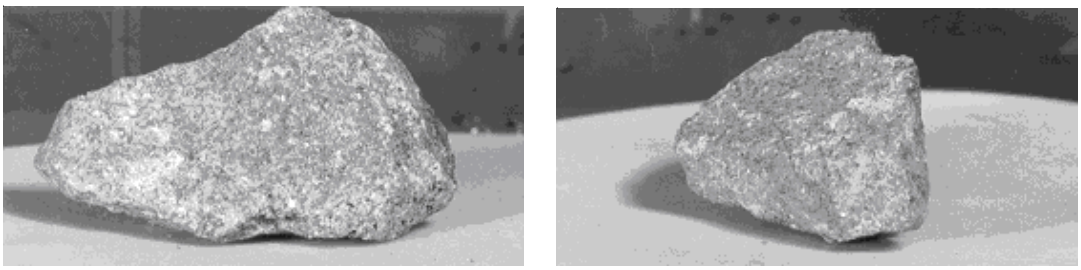


Figure 1: Photos of side and end of 14074. Sample is 3 cm long. NASA S71-26057 and 26054.

Figure 2: Photo of 14077. Sample is about 1.8 cm long. S71-26070.

Figure 3: Photo of 14079. Blocky, homogeneous sample is about 1.8 cm long. S71-26052.

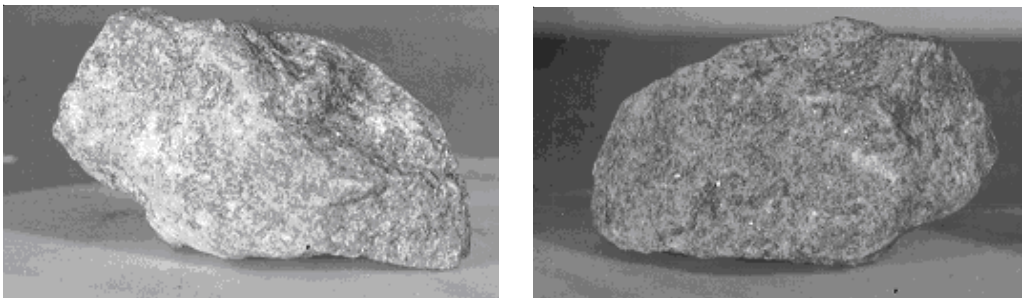


Figure 4: Two views of 14078. Sample is about 3 cm long. NASA S71-26048 and 26046.

Introduction

14074, 14077, 14078 and 14079 are feldspathic basalts from bottom of trench at station G (see section on 14149). They are similar to 14073 from the same location. 14310 was collected from the surface at the same station. Of these, 14078 has been shown to be a trace-element-rich basalt otherwise known as KREEP basalt (Meyer 1977). The smaller samples have not been analyzed.

Petrography

14074, 14077, 14078 and 14079 are each holocrystalline subophitic basalts with an abundance of lath-shaped plagioclase crystals (figures 5 - 8). Of these, only 14078 has been studied in detail (McKay et al. 1978). Figure 9 gives the composition of pyroxene.

The metallic iron in 14078 has high Ni, Co (figure 10).

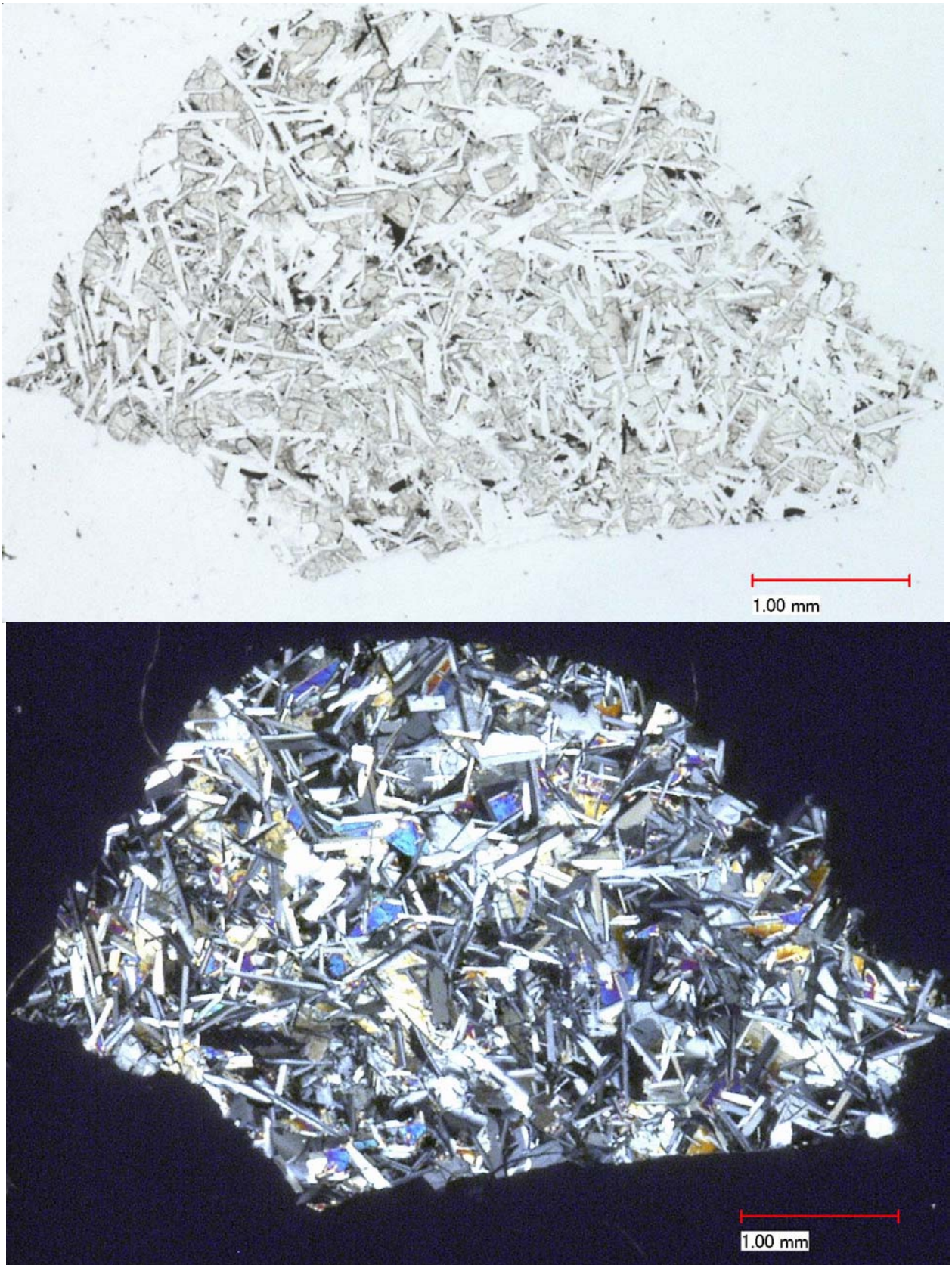


Figure 5: Photomicrographs of thin section 14074,4 by C Meyer @ 50x.

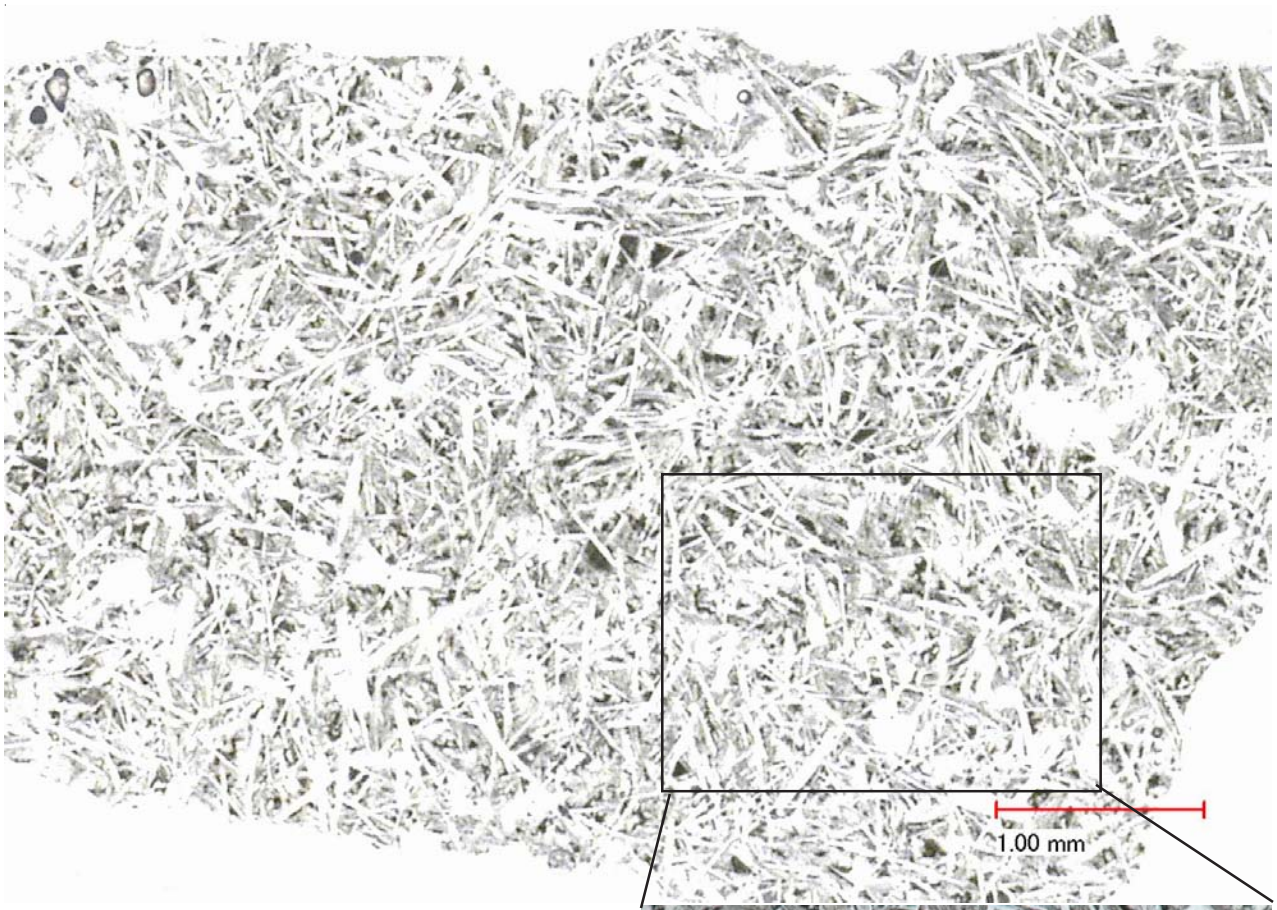


Figure 6a: Photomicrographs of thin section 14077,2 by C Meyer at 50 x and 150 x.

Chemistry

McKay et al. (1978) determined the chemical composition (figures 11, 12).

Radiogenic age dating

Stadermann et al. (1991) obtained Ar/Ar plateau ages of 3.78 ± 0.02 b.y for both 14074 and 14079 (figure 13). The Rb-Sr mineral isochron age for 14078 is 3.89 ± 0.02 b.y. (McKay et al. 1978) (figure 14). If this difference in age is real, then these samples are unrelated.

Cosmogenic isotopes and exposure ages

The ^{38}Ar cosmic-ray exposure age is 107 m.y. for 14074 and 97 m.y. for 14079 (Stadermann et al. 1991). Other samples from the bottom of this trench also have long exposure history.

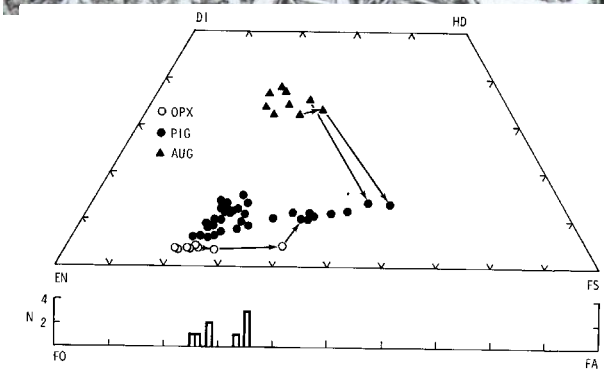
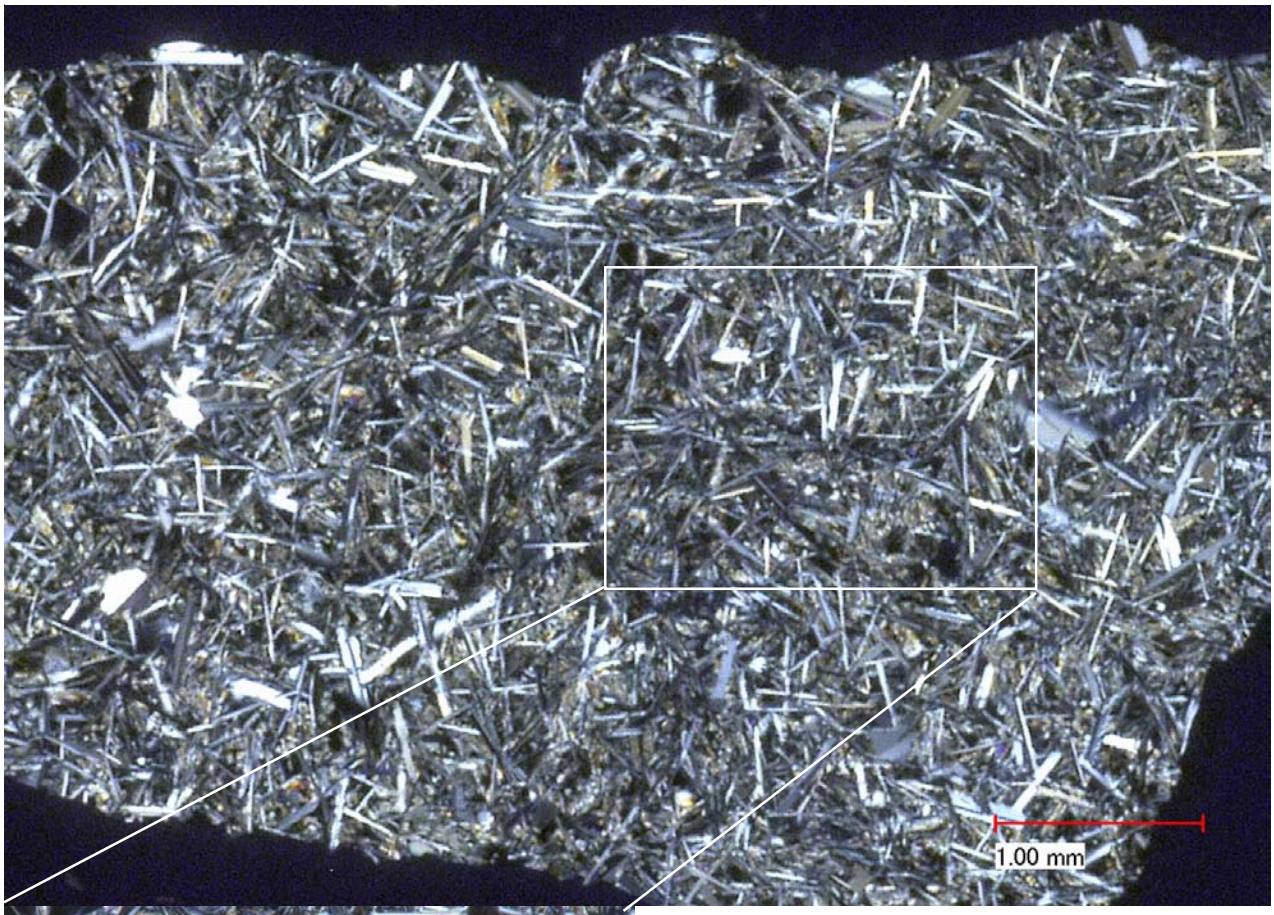


Figure 9: Composition of pyroxene and olivine in 14078 (McKay et al. 1978).



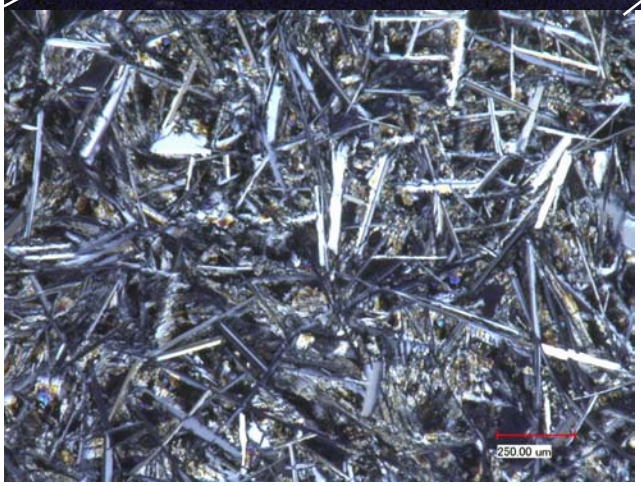


Figure 6b: Photomicrographs of thin section 14077,2 by C Meyer at 50 x and 150 x (crossed polarizers).

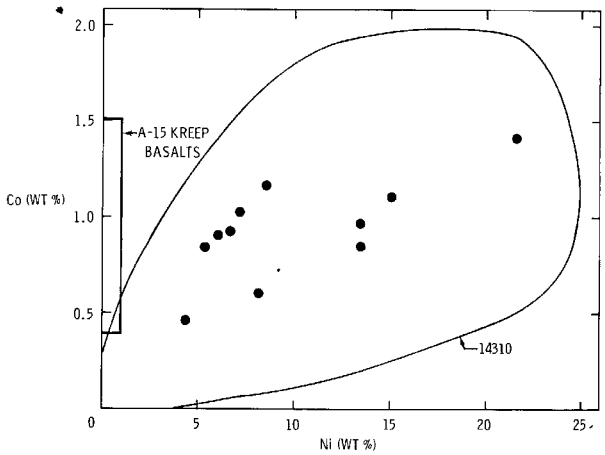


Figure 10: Ni and Co content of metallic iron in 14078 (McKay et al. 1978).

Mineralogical Mode of 14078

McKay et al. 1978

Olivine	6.5 %
Pyroxene	25.5
Plagioclase	64.4
Ilmenite	0.5
Meostasis	2.3
Phosphate	tr
Metal	tr

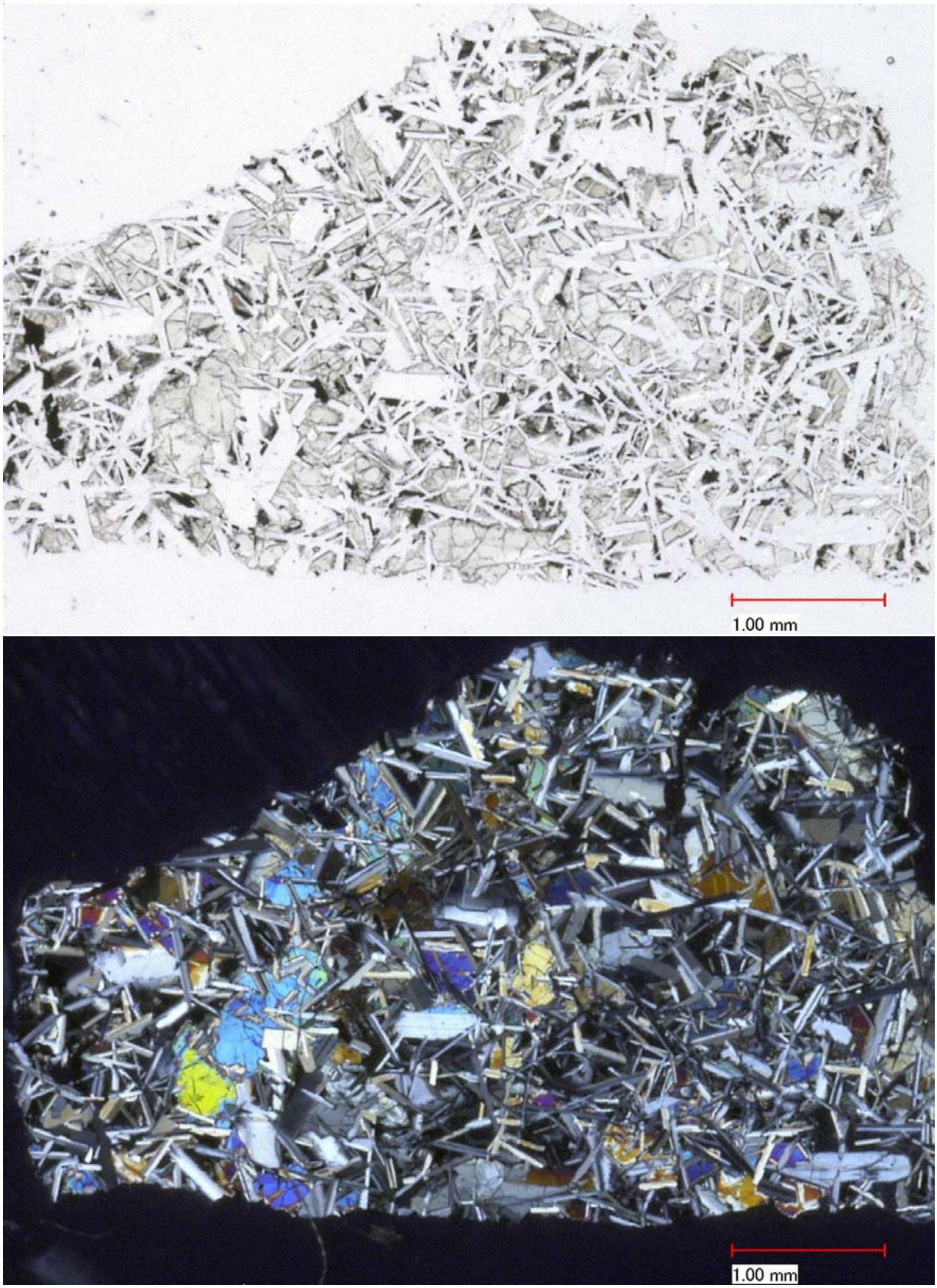


Figure 7: Photomicrographs of thin section 14078,4 by C Meyer @ 50x.

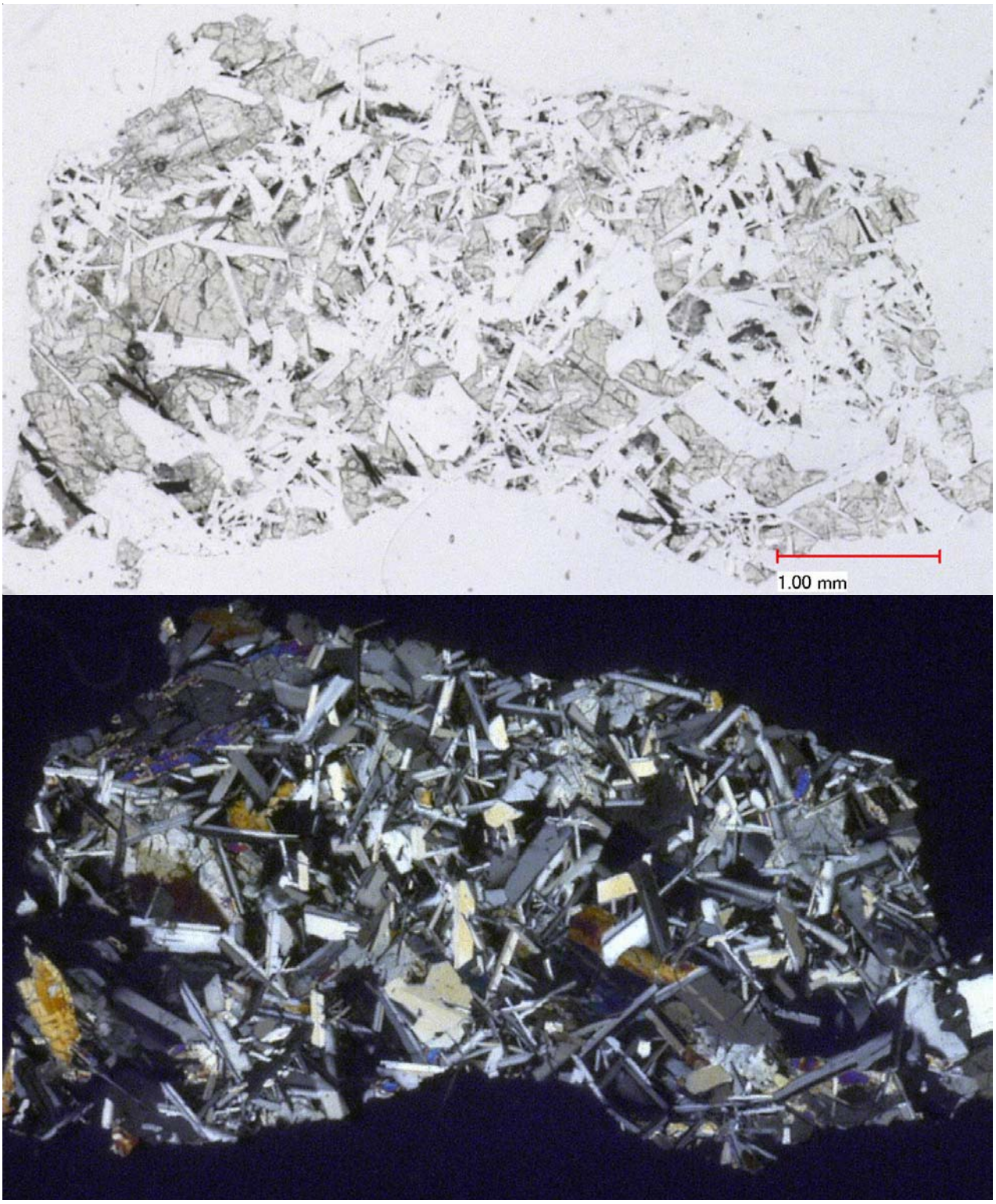


Figure 8: Photomicrographs of 14079,2 by C Meyer @50x.

Processing

Samples 14073 – 14079 were returned in bag 20N, included in ALSRC 1006. There are 2 thin sections for 14074, 2 thin sections of 14077, and 3 thin section of 14078, but only 1 thin section for 14079.

Table 1. Chemical composition of 14078.

reference	McKay78	
weight		
SiO2 %	47.3	(a)
TiO2	1.34	
Al2O3	20.3	
FeO	8.78	
MnO	0.11	
MgO	7.42	
CaO	12.7	
Na2O	0.75	
K2O	0.51	
P2O5	0.47	
S %		
sum		
Sc ppm		
V		
Cr		
Co		
Ni		
Cu		
Zn		
Ga		
Ge ppb		
As		
Se		
Rb	13.73	(b)
Sr	187.8	(b)
Y		
Zr		
Nb		
Mo		
Ru		
Rh		
Pd ppb		
Ag ppb		
Cd ppb		
In ppb		
Sn ppb		
Sb ppb		
Te ppb		
Cs ppm		
Ba	694	(b)
La	65.7	(b)
Ce	164	(b)
Pr		
Nd	100	(b)
Sm	28	(b)
Eu	2.19	(b)
Gd	32.5	(b)
Tb		
Dy	37.7	(b)
Ho		
Er	22.4	(b)
Tm		
Yb	19.7	(b)
Lu	2.8	(b)
Hf		
Ta		
W ppb		
Re ppb		
Os ppb		
Ir ppb		
Pt ppb		
Au ppb		
Th ppm		
U ppm		

technique: (a) fused bead e-probe, (b) IDMS

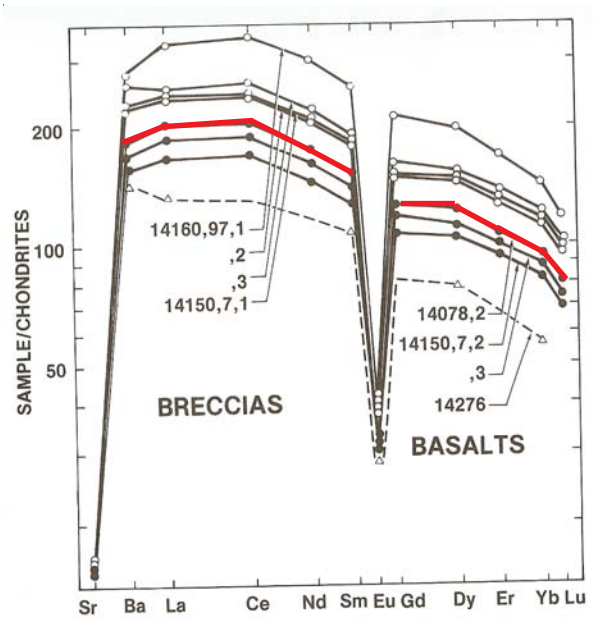


Figure 11: Normalized rare-earth-element diagram for KREEP basalts and breccia (McKay et al. 1979).

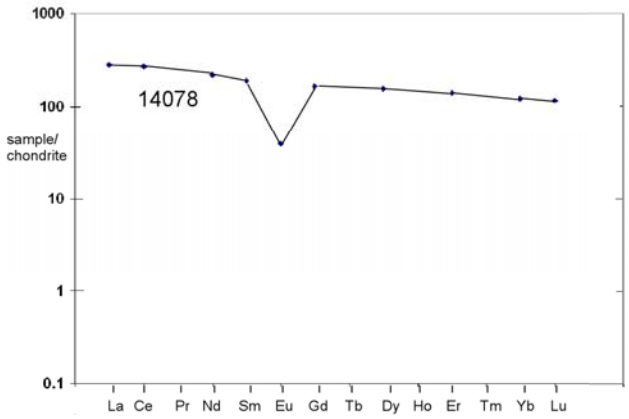


Figure 12: Normalized rare-earth-element diagram for 14078.

Summary of Age Data

		Ar/Ar	Rb/Sr
14074	Stadermann et al. 1991	3.78 ± 0.02 b.y.	
14079		3.78 ± 0.02	
14078	McKay et al. 1978		3.89 ± 0.02 b.y.

Caution: Uncorrected

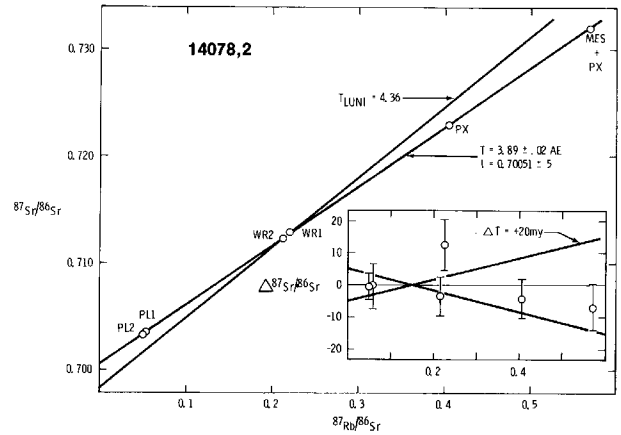


Figure 14: Rb/Sr isochron diagam for 14078 (McKay et al. 1978).

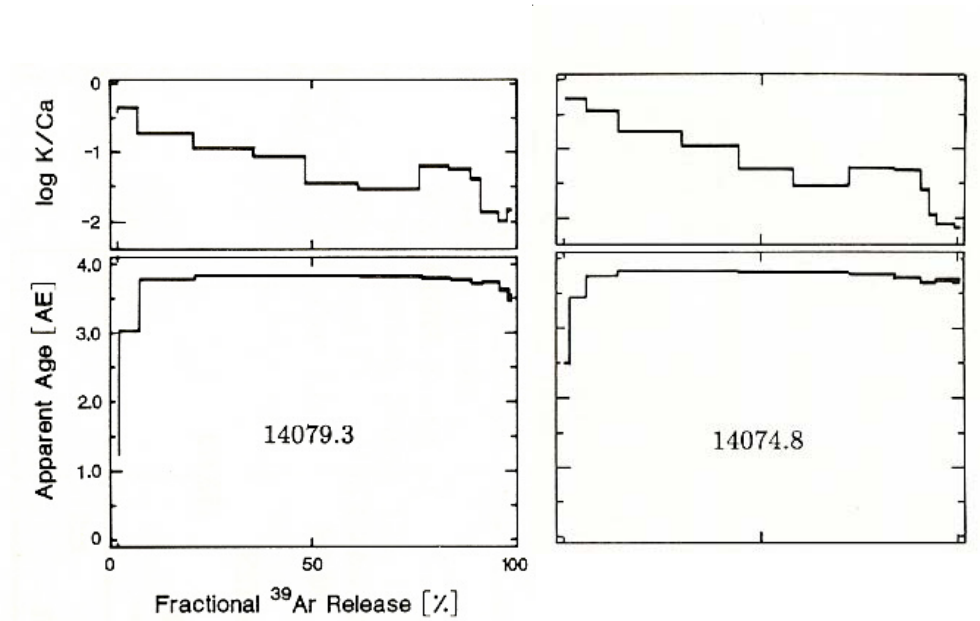
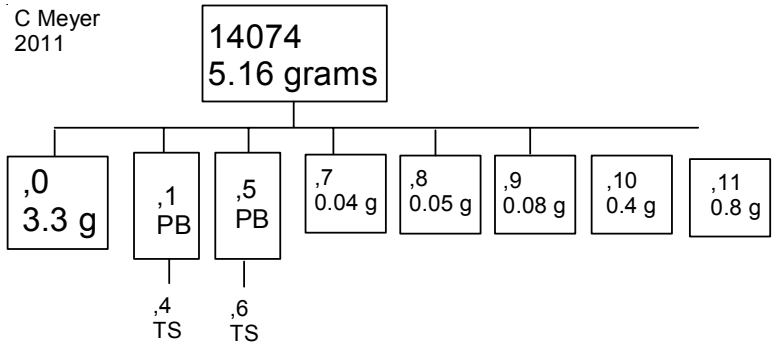


Figure 13: Ar/Ar plateau diagram for 14079 and 14074 (Stadermann et al. 1991).



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