

67559
Highland Basalt
32.84 grams



Figure 1: Photo of 67559 with scale (mm). S80-34090

Introduction

67559 was collected as a rake sample from the rim of North Ray Crater – see section on 67481. It has a nice igneous texture indicating that it cooled from a liquid, albeit, highly aluminous (figures 1 and 2). It contains a trace of Ni, Ir and Au and has been dated at 3.76 ± 0.04 b.y., which makes it a critical sample.

Yes, Virginia, there are basalts in the lunar highlands, but they are, in fact, impact melts! See also sections of 68415, 68416.

Mineralogical Mode 67559

	Vaniman and Papike 1980	Reimold et al. 1985
Plagioclase	74.7 %	83.1
Pyroxene	20.1	13.8
Olivine	2.1	-
Opaque	2.1	1.1
Mesostasis		2



Figure 2 a: Internal texture of 68559,1 (Ryder and Norman 1980). Crossed polarizer - width of field is 2 mm.



Figure 2b: Internal texture of 67559,13 (Reimold et al. 1985).

Petrography

Steele and Smith (1973) state that “feldspar-rich basalt 67559 has pyroxene and olivine ranges essentially identical to those of 68415”. Ryder and Norman (1980) and Vaniman and Papike (1981) noticed the same thing (figure 3). Reimold et al. (1985) separated the mesostasis and studied it carefully by SEM.

Plagioclase grains up to 1 mm are zoned from An_{98-90} .

Refer to figures 6 and 7.

Chemistry

Nava et al. (1974), Stoffler et al. (1985) and Wasson et al. (1977) have reported analyses of 67559.

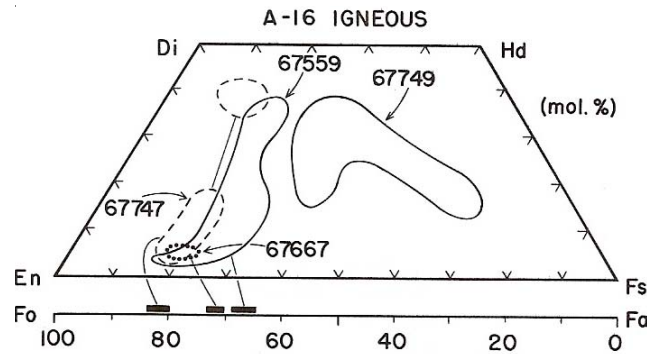


Figure 3a: Pyroxene in rake samples including field of 67559 (Steele and Smith 1973).

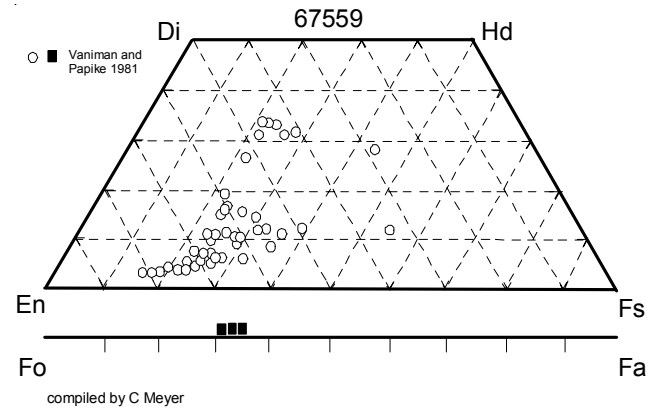


Figure 3b: Olivine and pyroxene in 67559 (Vaniman and Papike 1981).

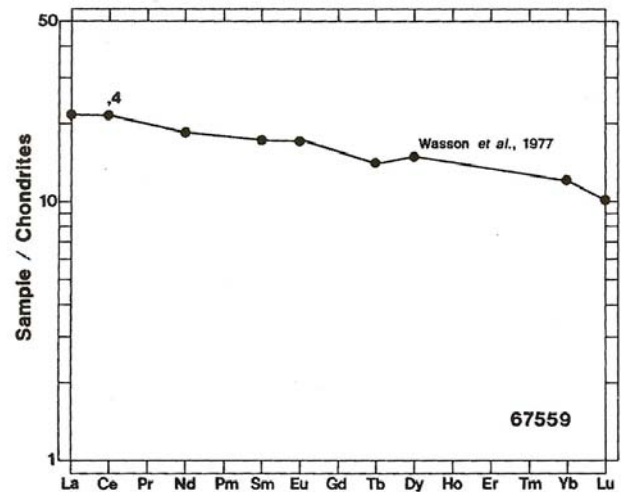


Figure 4: Normalized rare-earth-element diagram for 67559 (Ryder and Norman 1980).

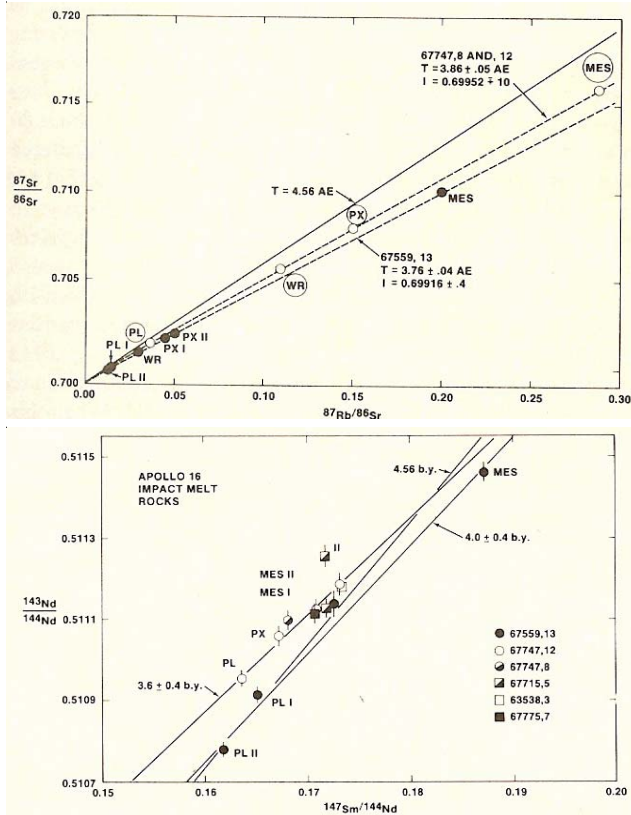


Figure 5: Two diagrams lifted from Reimold et al. (1985).

Summary of Age Data for 67559

	Rb/Sr
Reimold et al. 1985	3.76 +/- 0.04 b.y.

Caution: Changes in decay constant.

Additional data can be found in Tera et al. (1974) and Reimold et al. (1985).

Radiogenic age dating

Reimold et al. (1985) dated 67559 at 3.76 ± 0.04 b.y. by Rb-Sr and also reported data for Sm-Nd. Tera et al. (1974) also reported Rb/Sr and U/Th/Pb data for the whole rock. *I can't comprehend why there is no age by Ar/Ar.*

Processing

There are 4 thin sections from 3 different regions, yet no clasts were found.

Table 1. Chemical composition of 67559

reference weight	Wasson77	Nava74
SiO2 %	Vaniman	45.3 (b)
TiO2	0.47	(a) 0.26 (b)
Al2O3	29.8	(a) 27.42 (b)
FeO	4.31	(a) 4.3 (b)
MnO	0.06	(a) 0.054 (b)
MgO	3.8	(a) 4.47 (b)
CaO	16.5	(a) 16.4 (b)
Na2O	0.51	(a) 0.5 (b)
K2O	0.08	(a) 0.078 (b)
P2O5		0.113 (b)
S %		
sum		
Sc ppm	8.8	(a)
V	21	(a)
Cr	690	(a)
Co	20.6	(a)
Ni	257	(a)
Cu		
Zn	5.6	(a)
Ga	3.8	(a)
Ge ppb	320	(a)
As		
Se		
Rb		
Sr		
Y		
Zr		
Nb		
Mo		
Ru	26	(a)
Rh		
Pd ppb		
Ag ppb		
Cd ppb		
In ppb	11	(a)
Sn ppb		
Sb ppb		
Te ppb		
Cs ppm		
Ba	76	(a)
La	7.2	(a)
Ce	18	(a)
Pr		
Nd	11	(a)
Sm	3.1	(a)
Eu	1.2	(a)
Gd		
Tb	0.66	(a)
Dy	4.3	(a)
Ho		
Er		
Tm		
Yb	2.4	(a)
Lu	0.34	(a)
Hf	2.4	(a)
Ta	0.28	(a)
W ppb		
Re ppb		
Os ppb		
Ir ppb	11	(a)
Pt ppb		
Au ppb	5	(a)
Th ppm	1.1	(a)
U ppm	0.39	(a)

technique: (a) INAA, (b) AA, colorimetry

Figure 6: Photos of thin section 67559,9 by C Meyer. 2 mm across

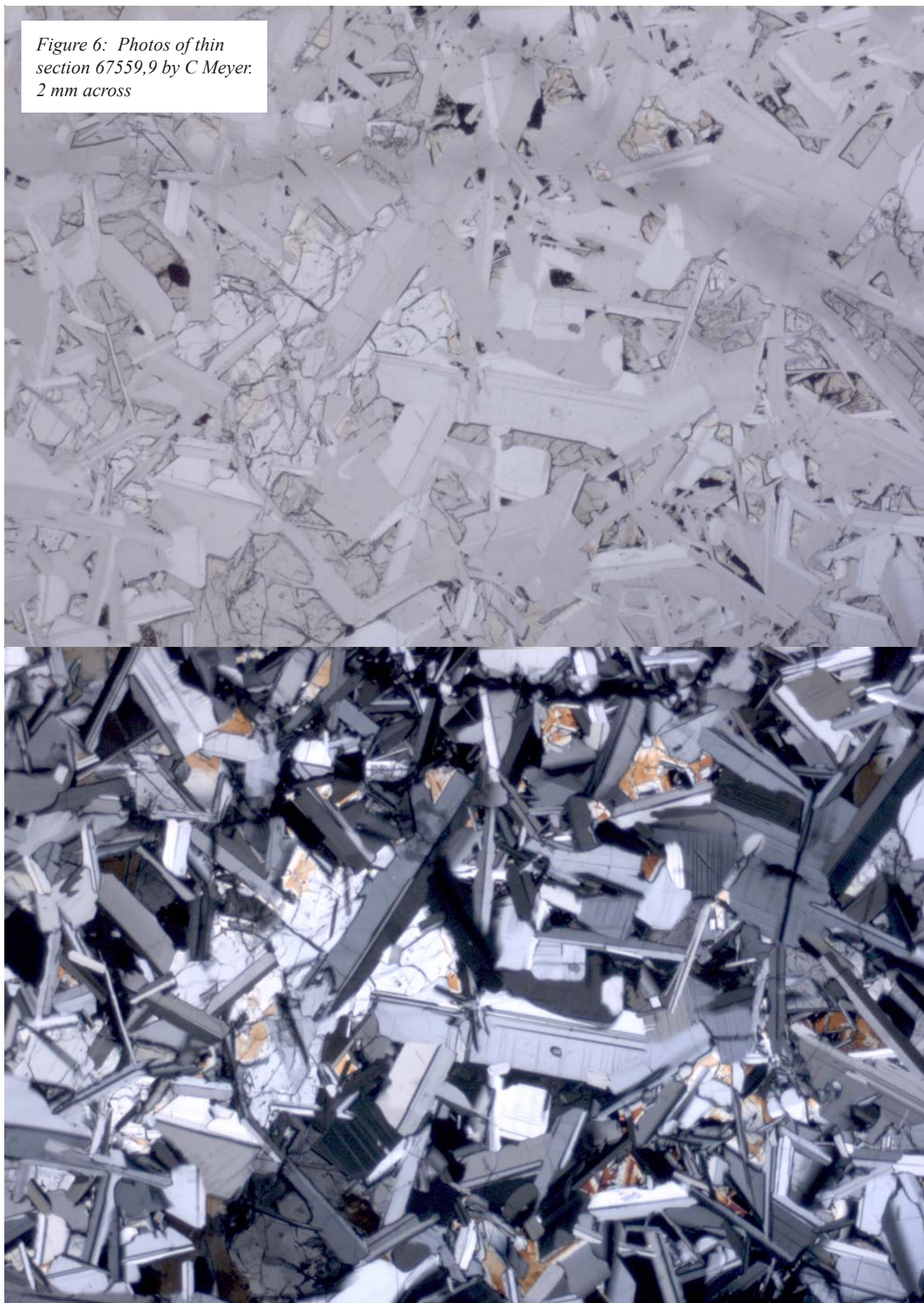
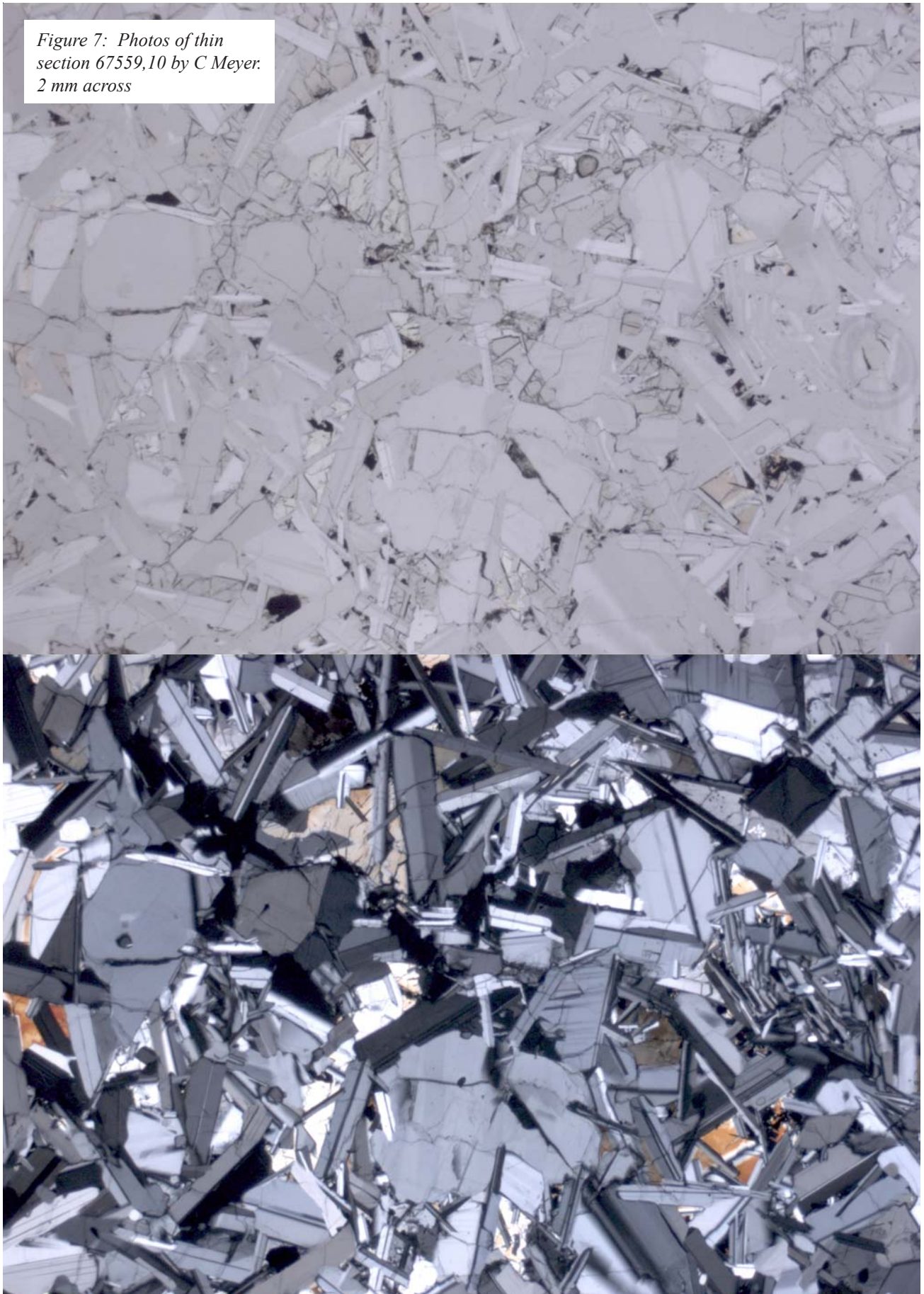
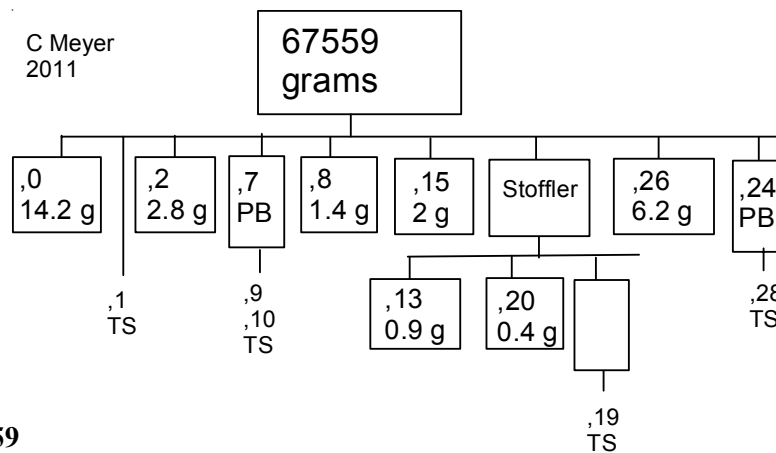


Figure 7: Photos of thin section 67559,10 by C Meyer. 2 mm across





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