

15546 and 15547

Coarse-grained, olivine-normative Basalt
27.8 and 20.1 grams



Figure 1: Photo of 15546. NASA S71-44923. Sample is 3.5 cm across.



Figure 2a: Photo of 15547. NASA S71-44948. Sample is 3.5 cm across.

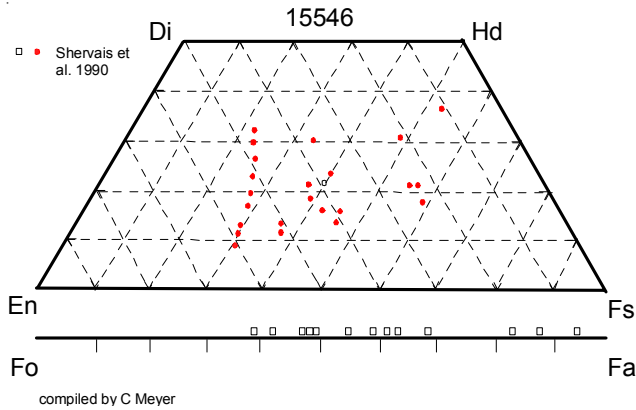


Figure 1b: Pyroxene and olivine composition of 15546 (Shervais et al. 1990).

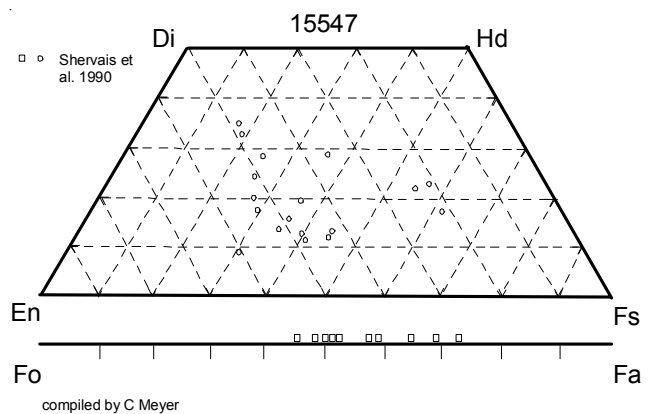


Figure 2b: Pyroxene and olivine composition of 15547 (Shervais et al. 1990).

Introduction

Lunar samples 15546 and 15547 were collected from near the edge of Hadley Rille in an area called The Terrace (see picture in 15595). The lunar regolith was thin in this area, with abundant rock samples (basalts) exposed (Swann et al. 1971).

Petrography

Ryder (1985) and Shervais et al. (1990) give the only description. The samples are similar, with a rather coarse-grained, granular texture (figures 3 and 4). Olivine grains are found in the centers of pigeonite. Opaque minerals are found in groups (segregations?)(figure 3). The mesostasis includes

Mineralogical Mode for 15546 and 15547

	Sample Catalog Butler 1971		Shervais et al. 1990	
	15546	15547	15546	15547
Olivine	1 %	10	13	17
Pyroxene	55	50	48	47
Plagioclase	45	40	29	27
Silica			1.3	3
Opakes	1	2	5	3
Fayalite			1.4	1
Mesostasis			1.8	1.4

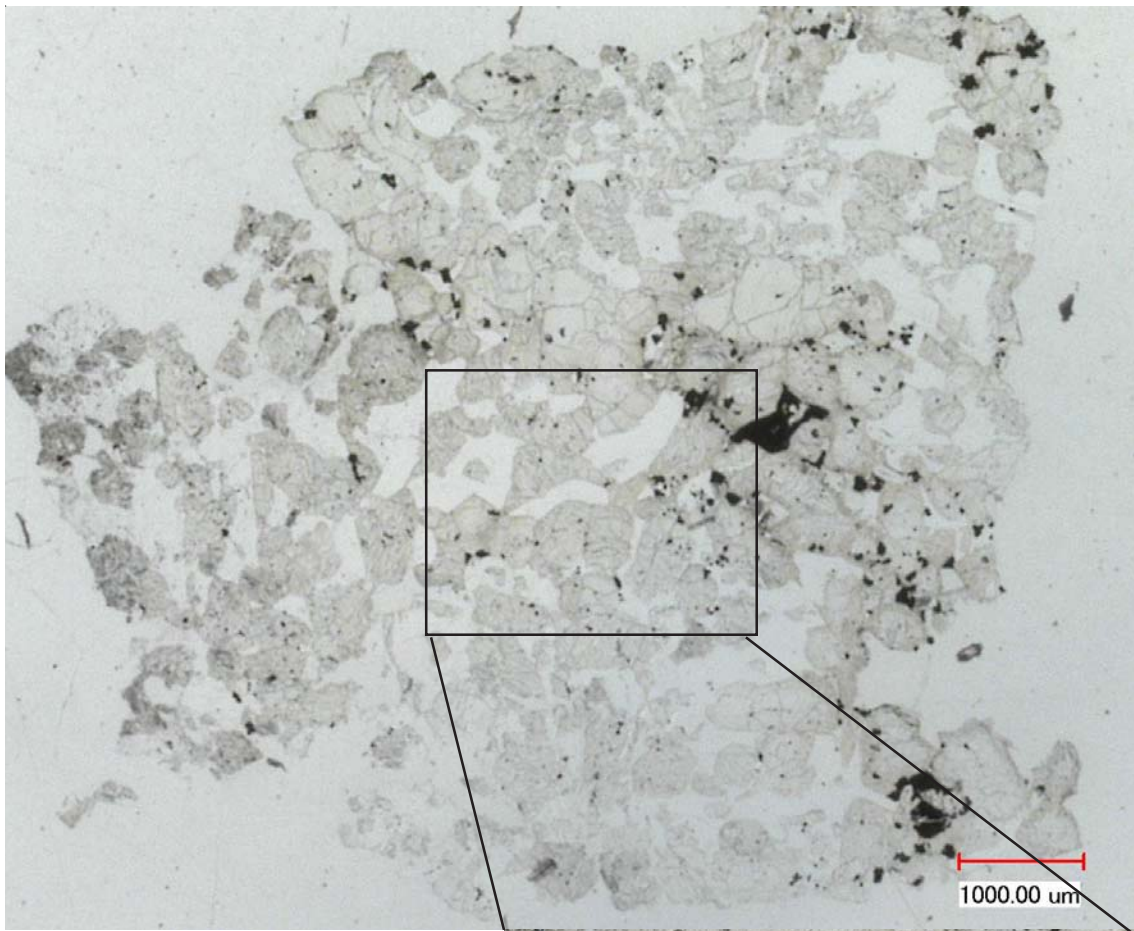


Figure 3a: Photomicrograph of 15546,5 by C Meyer at 30x and 100x.

crystalite, fayalite, troilite, whitlockite, Ni-Fe metal and brown glass.

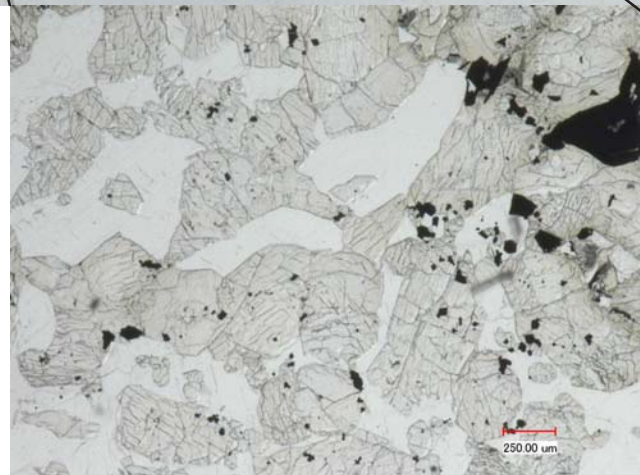
Mineralogy

Olivine: Mg-rich olivine is found in the cores of pyroxene and as inclusions in plagioclase. Fayalite is reported as a residual phase with sulfide (Shervais et al. 1990).

Pyroxene: Shervais et al. (1990) provided pyroxene analysis (figures 1b and 2b).

Plagioclase: Shervais et al. (1990) determined plagioclase is An₉₀₋₈₀.

Silica: Ryder (1985) reports that cristobalite is ubiquitous.



Chemistry

Shervais et al. (1990), Ryder and Schuraytz (2001) and Neal (2001). have analyzed 15546 and 15547 (table 1)(figures 5 and 6). They are typical olivine-normative basalts (figure 7).

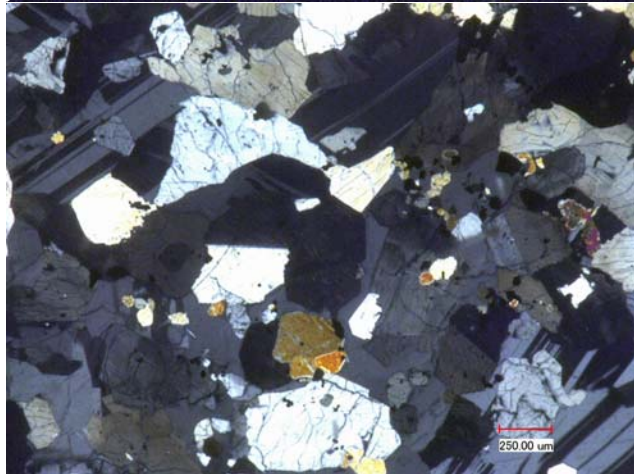
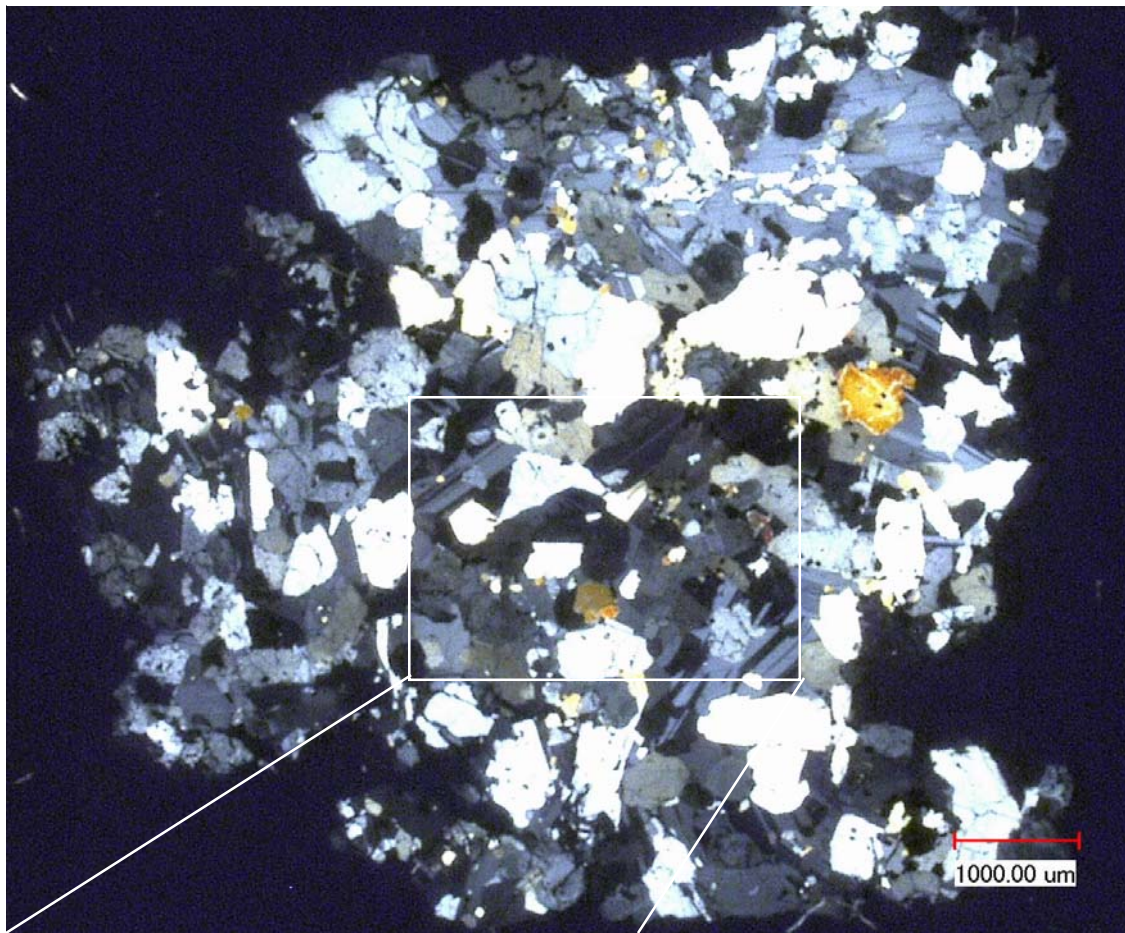


Figure 3b: Photomicrograph of 15546,5 by C Meyer at 30x and 100x (crossed polarizers).

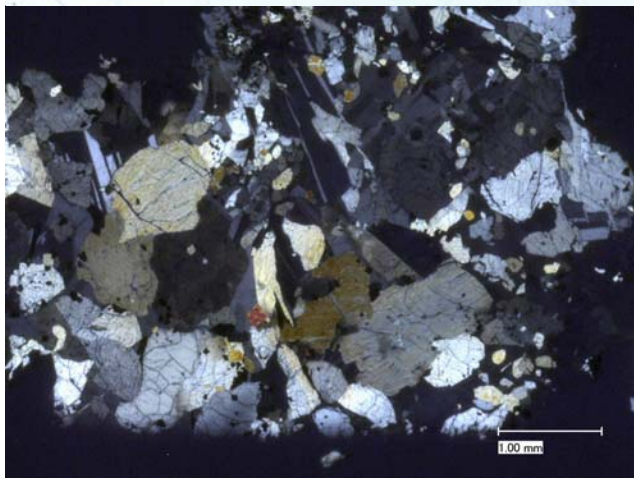
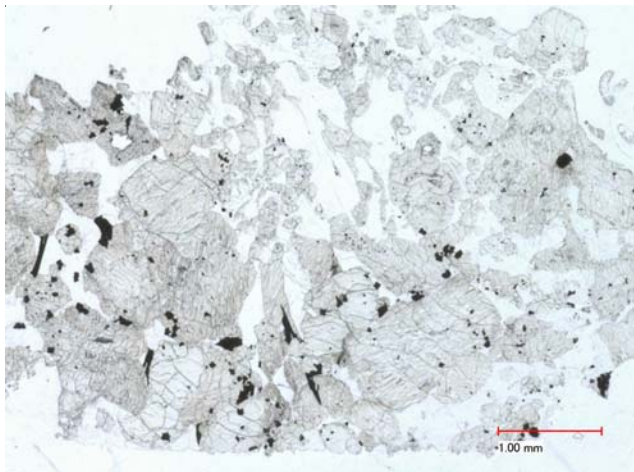


Figure 4: Photomicrographs of thin section 15547,6 by C Meyer @ 30x (bottom is with crossed nicols).

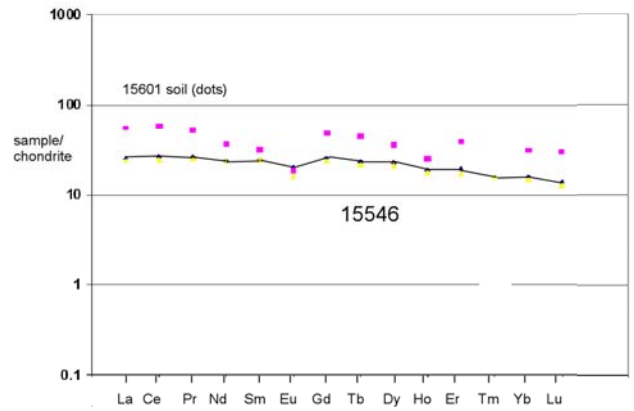


Figure 5: Normalized rare-earth-element pattern for 15546 compared with soil 15601.

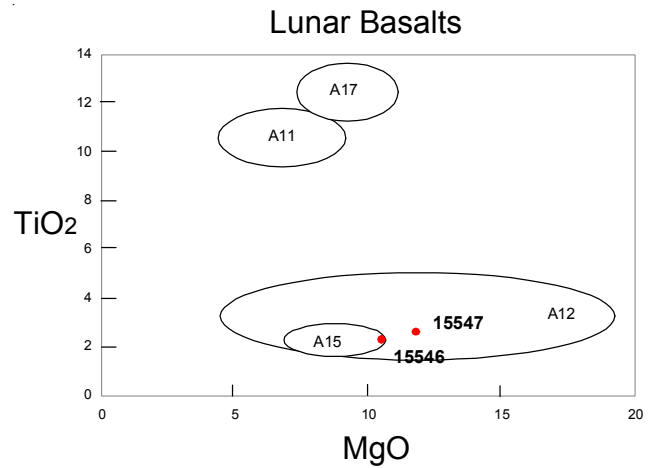


Figure 6: Chemical composition of 15546 and 15547 compared with that of other lunar basalts.

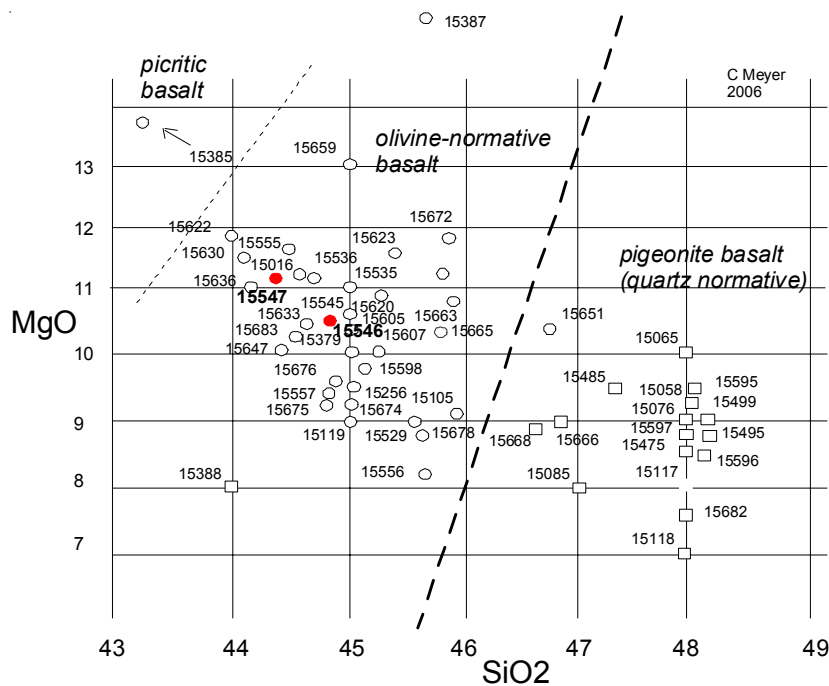
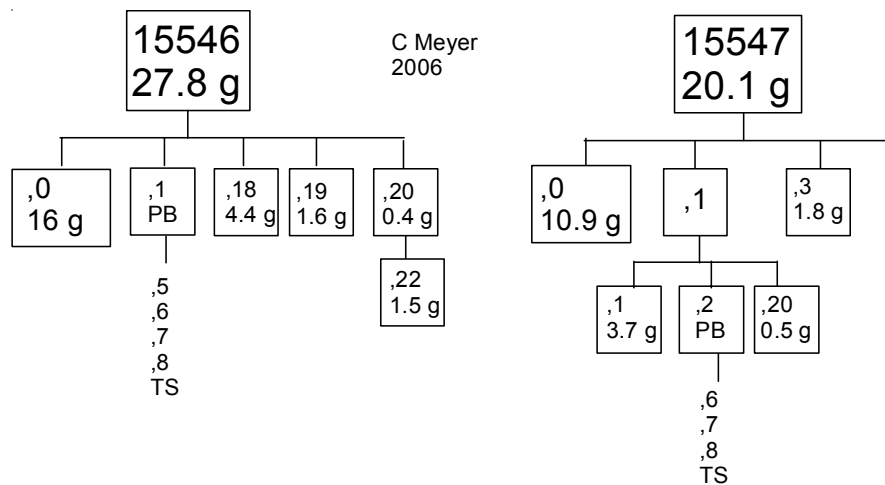


Figure 7: The big picture.

Table 1. Chemical composition of 15546 and 15547.

reference	15546 Ryder2001		15546 Neal2001		15546 Shervais90		15547 Ryder 2001		15547 Neal2001		15547 Shervais90							
weight	5 g				0.3 g		4.4 g				A+B							
SiO ₂ %	44.8	(a)			45.2	(c)	44.3	(a)			43.8	(c)						
TiO ₂	2.43	(a)			1.98	(c)	2.3	(a)			2.47	(c)						
Al ₂ O ₃	8.55	(a)			8.78	(c)	8.29	(a)			7.43	(c)						
FeO	22.4	(a)	22.8	(b)	21.08	(c)	20.1	(b)	22.75	(a)	22.8	(b)	24.44	(c)				
MnO	0.282	(a)			0.28	(c)			0.283	(a)			0.32	(c)				
MgO	10.43	(a)			11.41	(c)			11.35	(a)			11.23	(c)				
CaO	9.59	(a)			9.91	(c)			9.26	(a)			9.15	(c)				
Na ₂ O	0.232	(a)	0.251	(b)	0.27	(c)	0.28	(b)	0.216	(a)	0.244	(b)	0.24	(c)				
K ₂ O	0.046	(a)			0.02	(c)			0.044	(a)			0.04	(c)				
P ₂ O ₅	0.069	(a)			0.04	(c)			0.069	(a)			0.07	(c)				
S %																		
sum																		
Sc ppm		42.8	(b)	43.3	(d)		41.6	(b)		40.9	(b)	52	(d)	41.9	(b)			
V				254	(d)							316	(d)					
Cr	4354	(a)	4320	(b)	4323	(d)	4447	(c)	4270	(b)	4657	(a)	4570	(b)	6253	(d)	4310	(c)
Co			55.2	(b)	58.2	(d)			51	(b)			58	(b)	71.3	(d)	57.6	(b)
Ni	97	(a)	74	(b)	65.8	(d)			75	(b)	62	(a)	83	(b)	85.6	(d)	65	(b)
Cu	13	(a)			16.8	(d)					11	(a)			15.4	(d)		
Zn					20.6	(d)									19.4	(d)		
Ga					3.9	(d)									3.9	(d)		
Ge ppb																		
As																		
Se																		
Rb	5	(a)			1.02	(d)			6	(a)			1.04	(d)				
Sr	93	(a)	124	(b)	106	(d)		120	(b)	92	(a)	114	(b)	106	(d)	105	(b)	
Y	26	(a)			31.7	(d)				23	(a)			31.5	(d)			
Zr	89	(a)			107	(d)		<150	(b)	90	(a)			115	(d)	110	(b)	
Nb	12	(a)			6.94	(d)				16	(a)			7.12	(d)			
Mo					0.1	(d)								0.36	(d)			
Ru																		
Rh																		
Pd ppb																		
Ag ppb																		
Cd ppb																		
In ppb																		
Sn ppb																		
Sb ppb						(d)							40	(d)				
Te ppb																		
Cs ppm					0.03	(d)								0.03	(d)			
Ba		47	(b)	60.2	(d)		39	(b)		58	(b)	55.4	(d)	52	(b)			
La		5.39	(b)	5.89	(d)		2.64	(b)		5.09	(b)	5.28	(d)	5.34	(b)			
Ce		15.4	(b)	15.7	(d)		8.1	(b)		15.5	(b)	15.1	(d)	15.2	(b)			
Pr					2.29	(d)						2.28	(d)					
Nd		11	(b)	10.7	(d)					9	(b)	10.5	(d)					
Sm		3.83	(b)	3.57	(d)		2	(b)		3.57	(b)	3.59	(d)	3.83	(b)			
Eu		0.9	(b)	0.95	(d)		0.71	(b)		0.86	(b)	0.87	(d)	0.875	(b)			
Gd					4.99	(d)						4.8	(d)					
Tb		0.84	(b)	0.83	(d)		0.46	(b)		0.74	(b)	0.82	(d)	0.85	(b)			
Dy					5.4	(d)						5.04	(d)					
Ho					1.03	(d)						0.97	(d)					
Er					3.05	(d)						2.72	(d)					
Tm					0.38	(d)						0.36	(d)					
Yb		2.37	(b)	2.54	(d)		1.4	(b)		2.18	(b)	2.3	(d)	2.35	(b)			
Lu		0.32	(b)	0.33	(d)		0.19	(b)		0.29	(b)	0.29	(d)	0.332	(b)			
Hf		2.82	(b)	2.83	(d)		1.55	(b)		2.55	(b)	2.63	(d)	2.88	(b)			
Ta		0.41	(b)	0.44	(d)		0.2	(b)		0.38	(b)	0.4	(d)	0.41	(b)			
W ppb					10													
Re ppb																		
Os ppb																		
Ir ppb																		
Pt ppb																		
Au ppb																		
Th ppm		0.38	(b)	0.59	(d)		0.17	(b)		0.4	(b)	0.49	(d)	0.49	(b)			
U ppm					0.18	(d)		0.13	(b)			0.12	(d)	0.15	(b)			

technique: (a) XRF, (b) INAA, (c) fused bead, electron microprobe, (d) ICP-MS



References for 15546 and 15547

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