

15565  
Regolith Breccia  
822.6 grams



Figure 1a: Broken side of 15565,3. Sample is 6 cm across. S71-43021.



Figure 1b: Patina on exterior surface of 15565,3. Sample is 6 cm across. S71-43019.



Figure 2a: Fresh broken side of 15565,2. 6 cm across. S71-42074



Figure 2b: Flat side of 15565,2. S71-42963

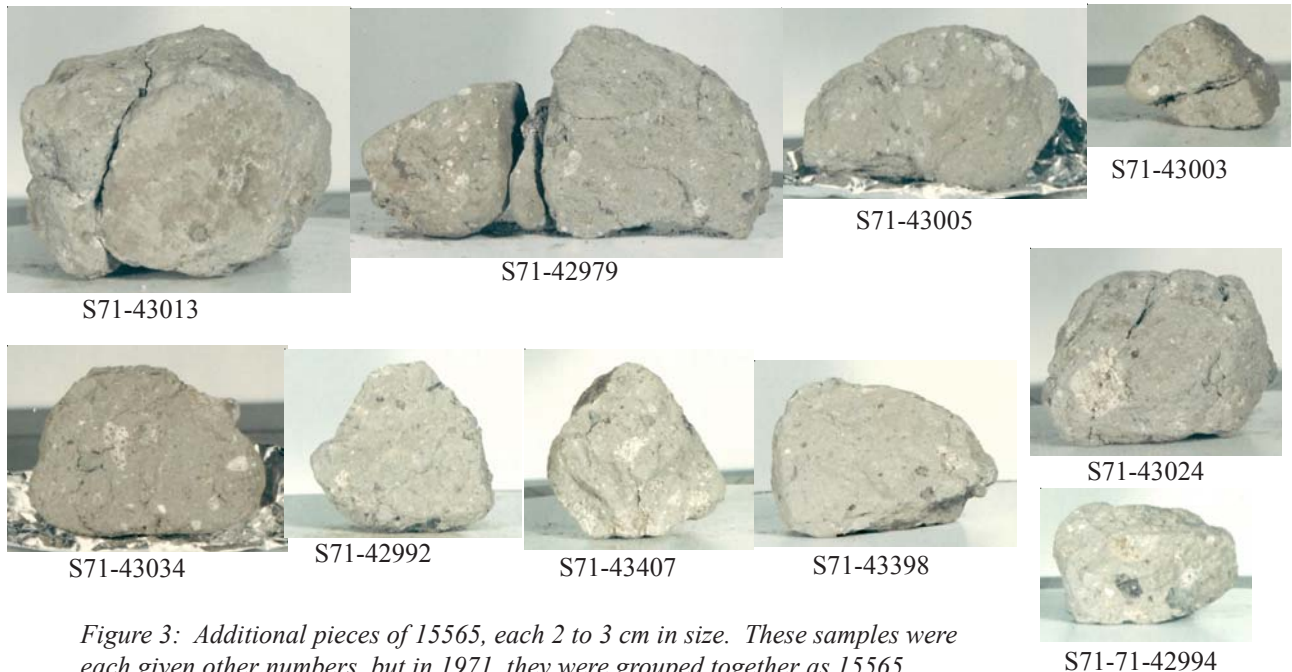


Figure 3: Additional pieces of 15565, each 2 to 3 cm in size. These samples were each given other numbers, but in 1971, they were grouped together as 15565.

## **Introduction**

At the end of the third EVA during Apollo 15, the astronauts collected loose undocumented samples from the regolith as 'grab' samples and placed them in sample collection bag #2. These included basalts and 15558, a large friable regolith breccia. The residue from this bag (about 38 pieces) was numbered together as 15565 (Butler 1971).

Sample 15565 is made up of numerous friable pieces, all with the same general appearance (Ryder 1985). Several have patina covered surfaces with micrometeorite pits indicating that there is more than one rock represented. However, it is equally probable that these are all pieces derived from breakup of 15558 – a similar lithology. The sampling location has not been identified, but is probably near station 9.

## **Petrography**

Juan et al. (1972) found that 15565 was a welded breccia with 50% glassy matrix enclosing 20% lithic clasts, 19% mineral clasts, 10% glass particles and 10% glass spheres. Simon et al. (1986) reported about the same composition (see table). McKay et al. (1989) reported 9.7 % agglutinate while Simon et al. (1986) reported only 2.2 % agglutinate. McKay et al. also reported a high percentage of KREEP basalt, while Simon et al. reported none (note the large basalt clast in figure 1). Fruland (1983) and Ryder (1985) also describe fragments of 15565 as porous 'regolith breccia'.

## **Significant Clasts**

Warren et al. (1981) describe a possibly pristine norite clast (An<sub>94</sub> ; En<sub>80</sub> ).

## **Chemistry**

Simon et al. (1986), McKay et al. (1989) analyzed the matrix of 15565 and got different results. Warren et al. (1981) analyzed a norite clast (table 1, figure 4). There is a high KREEP component.

## **Radiogenic age dating**

none

## **Other Studies**

Cadenhead et al. (1973) and Cadenhead and Stetter (1974) studied the surface area properties and desorption characteristics of 15565 (figure 5).

## **Mineralogical Mode for 15565**

(Simon et al. 1986)

Matrix	46.7 %	
	20-90 micron	90-100 micron
Mare Basalt	1.2	9.4
KREEP Basalt		
Feld. Basalt		
Plutonic		0.2
Granulitic	0.6	
Breccia	0.1	0.9
Olivine	2.7	0.9
Pyroxene	12.9	4.3
Plagioclase	7.2	0.9
Opagues	0.7	
Glass	5.7	3.1
Agglutinate	1.1	1.1

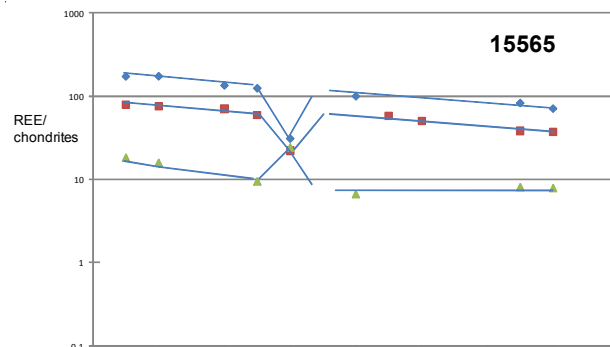


Figure 4: Normalized rare-earth-element diagram for 15565, matrix and clasts (see table 1).

## **Processing**

Lot of pieces – see figure 1 to 3.

**Table 1. Chemical composition of 15565.**

reference weight	Ryder85		Warren81 norite clast		Simon86		McKay89	
SiO <sub>2</sub> %			48.2	(b)				
TiO <sub>2</sub>	1.91		0.1	(b)	1.9	(b)	1.91	(a)
Al <sub>2</sub> O <sub>3</sub>	13.3	14.1	24.9	(b)	12.3	(b)	13.3	(a)
FeO	13.5		4.1	(b)	17.9	(b)	14.1	(b)
MnO			0.07		0.22	(b)	0.18	(a)
MgO	9.2		8.8	(b)	10.4	(b)	9.2	(a)
CaO	10.5	9.6	13.3	(b)	10.2	(b)	9.6	(b)
Na <sub>2</sub> O	0.58	0.58	0.425	(b)	0.41	(b)	0.58	(a)
K <sub>2</sub> O			0.06	(b)	0.16	(b)		
P <sub>2</sub> O <sub>5</sub>								
S %								
sum								
Sc ppm	28.1	29	6.7	(b)	35	(b)	29	(b)
V					150	(b)		
Cr	2890	2600	1510	(b)	3140	(b)	2600	(b)
Co	32.7	33.2	20	(b)	43	(b)	33.2	(b)
Ni	95	111	8.8	(b)	130	(b)	111	(b)
Cu								
Zn			1.68	(b)				
Ga			3.9	(b)				
Ge ppb			18.1	(b)				
As								
Se								
Rb								
Sr	100	150	200	(b)	110	(b)	150	(b)
Y								
Zr		620	<260	(b)	250	(b)	620	(b)
Nb								
Mo								
Ru								
Rh								
Pd ppb								
Ag ppb								
Cd ppb								
In ppb								
Sn ppb								
Sb ppb								
Te ppb								
Cs ppm	0.43	0.36		(b)			0.36	(b)
Ba	760	385	68	(b)	190	(b)	385	(b)
La	42.9	40.6	4.25	(b)	18.4	(b)	40.6	(b)
Ce	103	105	9.5	(b)	45	(b)	105	(b)
Pr								
Nd	68	61		(b)	32	(b)	61	(b)
Sm	20.1	18.4	1.38	(b)	8.75	(b)	18.4	(b)
Eu	1.85	1.74	1.36	(b)	1.25	(b)	1.74	(b)
Gd					1.94	(b)		
Tb	4.08	3.63	0.24	(b)			3.63	(b)
Dy					14	(b)		
Ho					2.8	(b)		
Er								
Tm					1	(b)		
Yb	14.4	13.5	1.35	(b)	6.2	(b)	13.5	(b)
Lu	1.99	1.72	0.19	(b)	0.89	(b)	1.72	(b)
Hf	17.8	14.6	0.69	(b)	6.12	(b)	14.6	(b)
Ta		1.79		(b)	0.82	(b)	1.79	(b)
W ppb								
Re ppb			7.1	(b)				
Os ppb								
Ir ppb			0.03	(b)			3	(b)
Pt ppb								
Au ppb			0.07	(b)			4	(b)
Th ppm			0.43	(b)	2.8	(b)	6.6	(b)
U ppm			0.31	(b)	0.7	(b)	1.72	(b)

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

numerous pieces,  
may not all be same rock

C Meyer  
2009

15565  
822.6 g

many pieces

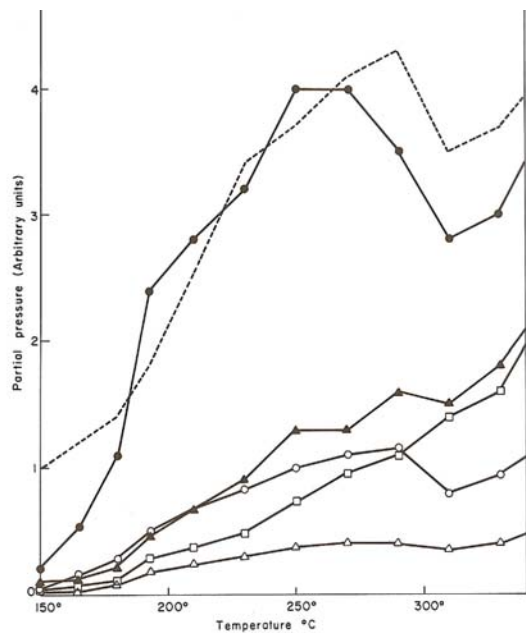
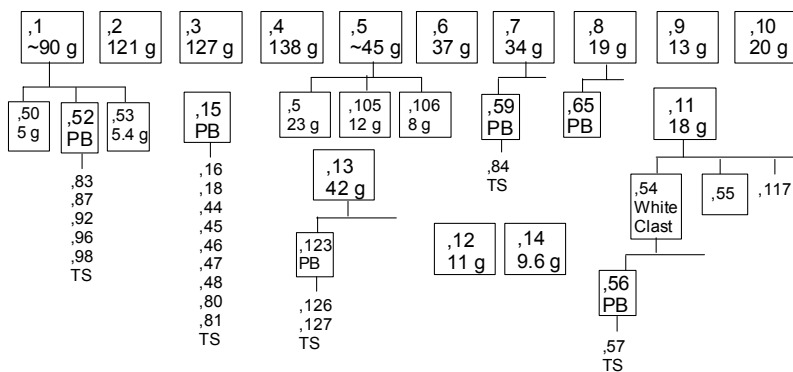


Figure 5: Thermal release curves for desorption of various species (Caddenhead et al. 1973). Black dot is H<sub>2</sub>O, black triangle is N<sub>2</sub> and CO, square is CO<sub>2</sub>, open circle is H<sub>2</sub>.

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