15027 – 51 grams
15028 – 59.4 grams
Regolith Breccia

Figure 1: Photo of 15027. S71-43635

Figure 2 a,b: Photos of 15028. Cube is 1 inch. S71-43639 and 43641

Figure 3: Surface photo of 15027 and 15028. AS15-86-11606

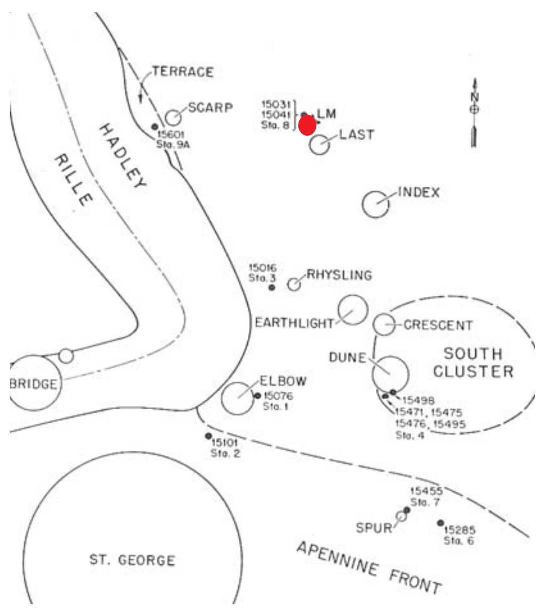

Figure 4: Location of 15027 on map of Apollo 15.

Introduction

15027 and 15028 are both glass-coated breccias found together near the LM. They were returned in the same bag (DB162), but are identified as independent objects on lunar surface (figure 3).

Petrography

McKay et al. (1989) reported that the maturity index for 15028 was $I_s/FeO = 26$.

Kridelbaugh et al. (1972) reported that about 30 % of 15028 is glass and that it had numerous clasts of KREEP basalt. Uhlmann et al. (1981) used the glass to estimate cooling rate (fast).

Chemistry

Wanke et al. (1976) found 15027 and 15028 to have similar composition. As is the case for other Apollo 15 breccia samples, 15027 and 15028 have higher trace element content than Apollo 15 soils (figure).

Other Studies

Bogard determined the rare gas content and isotopic ratio for 15028 – reported in McKay et al. (1989).

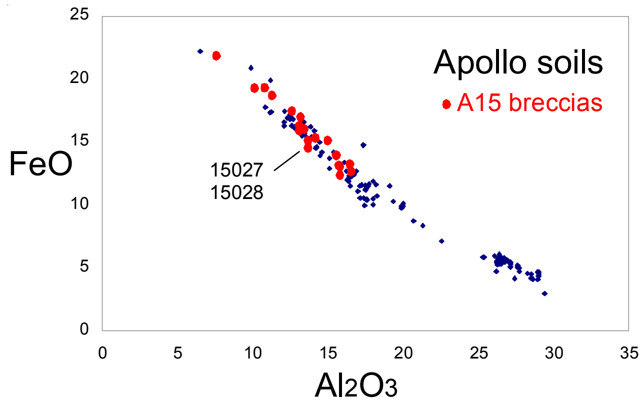

Figure 5: Composition of Apollo soils, Apollo 15 breccias and 15028.

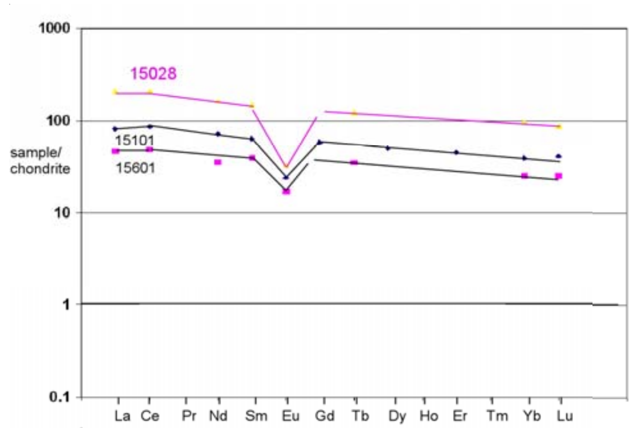

Figure 6: Thace element composition of 15028 and some soils.

References for 15028

Butler P. (1971) Lunar Sample Catalog, Apollo 15. Curators' Office, MSC 03209

Kridelbaugh S.J., Grieve RAF and Weill D.F. (1972) Glass compositions in breccias 15028 and 15059. *In* **The Apollo 15 Lunar Samples**, 123-125.

LSPET (1972a) The Apollo 15 lunar samples: A preliminary description. *Science* **175**, 363-375.

LSPET (1972b) Preliminary examination of lunar samples. Apollo 15 Preliminary Science Report. NASA SP-289, 6-1—6-28.

McKay D.S., Morris R.V. and Wentworth S.J. (1984) Maturity of regolith breccias as revealed by ferromagnetic and petrographic indicies (abs). *Lunar Planet. Sci.* **XV**, 530-531. Lunar Planetary Institute, Houston.

McKay D.S., Bogard D.D., Morris R.V., Korotev R.L., Wentworth S.J. and Johnson P. (1989) Apollo 15 regolith breccias: Window to a KREEP regolith. *Proc. 19th Lunar Sci. Conf.* 19-41. Lunar Planetary Institute, Houston.

Ryder G. (1985) Catalog of Apollo 15 Rocks (three volumes). Curatoial Branch Pub. # 72, JSC#20787

Swann G.A., Hait M.H., Schaber G.C., Freeman V.L., Ulrich G.E., Wolfe E.W., Reed V.S. and Sutton R.L. (1971b) Preliminary description of Apollo 15 sample environments. U.S.G.S. Interagency report: 36. pp219 with maps

Swann G.A., Bailey N.G., Batson R.M., Freeman V.L., Hait M.H., Head J.W., Holt H.E., Howard K.A., Irwin J.B., Larson K.B., Muehlberger W.R., Reed V.S., Rennilson J.J., Schaber G.G., Scott D.R., Silver L.T., Sutton R.L., Ulrich G.E., Wilshire H.G. and Wolfe E.W. (1972) 5. Preliminary Geologic Investigation of the Apollo 15 landing site. In Apollo 15 Preliminary Science Rpt. NASA SP-289. pages 5-1-112.

Uhlmann D.R., Yinnon H. and Fang C.-Y. (1981) Simplified model evaluation of cooling rates for glass-containing lunar compositions. *Proc. 12th Lunar Planet. Sci. Conf.* 281-288.

Wänke H., Baddenhausen H., Blum K., Cendales M., Dreibus G., Hofmeister H., Kruse H., Jagoutz E., Palme C., Spettel B., Thacker R. and Vilcsek E. (1977a) On the chemistry of lunar samples and achondrites. Primary matter in the lunar highlands: A re-evaluation. *Proc. 8th Lunar Sci. Conf.* 2191-2213.

Table 1. Chemical composition of 15028

			15028	15027					
reference	McKay89		Wanke77			Kriedelbaugh72		Uhlmann81	
weight						glass	vein		
SiO2 %			48.9	49.4	(b)	48	46.5	49	(c)
TiO2	2	(a)	1.79	1.89	(b)	1.75	1.6	1.4	(c)
Al2O3	13.6	(a)	12.88	13.78	(b)	14.7	16.5	12.9	(c)
FeO	14.5	(a)	14.2	14.2	(b)	14.1	13.7	14.1	(c)
MnO	0.19	(a)	0.2	0.2	(b)				
MgO	9.2	(a)	9.25	9.2	(b)	8.7	8.6	7.4	(c)
CaO	9.8	(a)	10.4	10.44	(b)	10.3	10.7	9.5	(c)
Na2O	0.55	(a)	0.58	0.6	(b)	0.59	0.64	0.6	(c)
K2O			0.41	0.42	(b)	0.41	0.36	0.4	(c)
P2O5			0.36	0.394	(b)	0.3	0.37		(c)
S %									
sum									
Sc ppm	28.7	(a)	29.9	30.8	(b)				
V	83	(a)	95.6	98	(b)				
Cr	2410	(a)	2570	2620	(b)	1600	950	1300	(c)
Co	35.2	(a)	39	39	(b)				
Ni	135	(a)	200	180	(b)				
Cu			5.3		(b)				
Zn			8		(b)				
Ga			3.36		(b)				
Ge ppb			300		(b)				
As			63		(b)				
Se			350		(b)				
Rb			10.7		(b)				
Sr	170	(a)	139	145	(b)				
Y			154	158	(b)				
Zr	660	(a)	666	662	(b)				
Nb			48	47	(b)				
Mo									
Ru									
Rh									
Pd ppb									
Ag ppb									
Cd ppb									
In ppb									
Sn ppb									
Sb ppb									
Te ppb									
Cs ppm	0.44	(a)	0.53		(b)				
Ba	523	(a)	501	515	(b)				
La	48.6	(a)	46.9	47.3	(b)				
Ce	127	(a)	130	129	(b)				
Pr			16.7		(b)				
Nd	73	(a)	74	75	(b)				
Sm	21.9	(a)	19.7	20.7	(b)				
Eu	1.86	(a)	1.77	1.81	(b)				
Gd			26.2		(b)				
Tb	4.42	(a)	4.53	4.54	(b)				
Dy			26.9	26.4	(b)				
Ho			5.6		(b)				
Er			17.4		(b)				
Tm									
Yb	15.5	(a)	15.8	15.7	(b)				
Lu	2.12	(a)	2.18	2.17	(b)				
Hf	18	(a)	17	17	(b)				
Ta	2.08	(a)	2.01	2.05	(b)				
W ppb			980		(b)				
Re ppb			0.51		(b)				
Os ppb									
Ir ppb	3.8	(a)		3	(b)				
Pt ppb									
Au ppb	9.6	(a)	4		(b)				
Th ppm	8.3	(a)	7.49	7.45	(b)				
U ppm	2.37	(a)	2.37	2.3	(b)				

technique: (a) INAA, (b) various, (c) elec. Probe