

TOTAL SULFUR CONTENTS OF APOLLO 15 AND APOLLO 16 LUNAR SAMPLES,
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Total sulfur abundances have been determined for a suite of Apollo 15 and Apollo 16 fines, breccias, and rock samples. The analytical techniques utilized were the same as that used for Apollo 14 samples (1,2). The results for Apollo 15 are given in Table 1 and Apollo 16 results are given in Table 2. For the Apollo 15 lunar fines the total sulfur abundances range from 440 to 900 $\mu\text{g S/g}$. Sulfur abundances for Apollo 16 fines range from 430 to 880 $\mu\text{g S/g}$. Basalts from Apollo 15 range from 340 to 820 $\mu\text{g S/g}$ and anorthositic rocks from Apollo 16 have less than 27 $\mu\text{g/g}$ total sulfur. A complex breccia distribution ranges from <20 to 1010 $\mu\text{g S/g}$ for the Apollo 15 and 16 samples.

The total sulfur content for the Apollo 15 and 16 lunar fines can be accounted for by mixing models based upon the sulfur contribution from individual components found in the fines at a particular station, similar to models constructed by the authors for Apollo 11, 12, and 14(1,2). Table 3 illustrates the total sulfur balance for 3 Apollo 15 stations based on the petrologic makeup of the fines collected at that station as given by Reid et al. (3). The total sulfur value for the green glass component is from 15426,32, given in Table 1. The Mare-derived and low-K, high Al basalt values were taken from analyses by Compston et al. (4) and Hubbard and Gast (5). The Fra Mauro estimation is from LSPET (6) and calculations by the authors utilizing unpublished Apollo 12 results in a mixing diagram following the method of Wänke(7). The Highland basalt value was selected from LSPET(8) and anorthositic values from LSPET(8) and 60015,61, 67455,7 (Table 2). Table 4 gives a mixing model for Apollo 16 for station 1, based on the petrologic makeup of 61221 given by Ridley et al (9).

The results indicate that large amounts of sulfur cannot have been added to the lunar surface from meteorites unless some major loss mechanism has taken place. This is brought out by the Apollo 16 model based on 61221 which has a high concentration of low temperature volatiles(10) which has been interpreted by Gibson(10) as possible evidence for the formation of North Ray ejecta by cometary impact. The total sulfur abundance of 61221(11) in accordance with the model can be explained by the sulfur contribution of the individual rock components which makeup the North Ray ejecta.

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S OF APOLLO 15 AND 16 LUNAR SAMPLES

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Table 2. Total Sulfur in Apollo 16 Samples

Table I. Surface in Apollo 15 Samples

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Table 3. Apollo 15 mixing model for lunar fines*

Rock Type	Station 2 St. George Site			LM Site			Station 9A Kille Site	
	Sulfur observed (ugS/g)	Relative abundance (%)	Sulfur contribution (ugS/g)	Relative abundance (%)	Sulfur contribution (ugS/g)	Relative abundance (%)	Sulfur contribution (ugS/g)	
Green glass	350	39	137	12	42	51	179	
Mare-derived	1200	19	228	27	324	21	252	
Highland basalt	300	8	24	8	24	4	12	
Fra-Mauro	1000	14	140	36	360	16	176	
Low K-High Al basalt	1100	20	220	17	187	9	99	
Granite	?	.05	—	.6	—	.6	—	
Total calculated fines			750		940		720	
Observed fines			750-850		850-900		800	

Table 4. Apollo 16 mixing model for lunar fines*

Station 1 Rim of Plum Crater			
Rock type	sulfur observed (ugS/g)	relative abundance (%)	sulfur contribution (ugS/g)
Highland basalt	300	68	204
Low K High Al basalt	1100	14	154
Fra Mauro	1000	7	70
Mare-derived	1200	7	84
Anorthosite	25	4	1

* Total calculated fines = 510; observed = 500 (10)