

**Table 11.** Composition of Martian surface materials.

Ref.	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	CaO	K <sub>2</sub> O	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	Cr <sub>2</sub> O <sub>3</sub>	MnO	SO <sub>3</sub>	Na <sub>2</sub> O	Cl
<b>Viking Fines</b>													
Viking 1 (C5 Duricrust)	82Cla	42 ± 6.0	6.9 ± 4.0	17.4 +5.0/-2.0	7 +5.0/-3.0	5.6 ± 2.0	0 ± 0.05	0.60 ± 0.25			9.5 +6.0/-2.0		0.9 +1.5/-0.5
Viking 1 (C13 Duricrust)	82Cla	43 ± 6.0	7.40 ± 4.0	18.2 +5.0/-2.0	7 +5.0/-3.0	5.4 ± 2.0	0 ± 0.05	0.59 ± 0.25			9.0 +6.0/-2.0		0.9 +1.5/-0.5
Viking 1 (C9 Bulk)	82Cla	45 ± 6.0	7.5 ± 4.0	18.9 +5.0/-2.0	5 +5.0/-3.0	6.0 ± 2.0	0 ± 0.05	0.71 ± 0.25			7.2 +6.0/-2.0		0.8 +1.5/-0.5
Viking 1 (C1 Fines)	82Cla	43 ± 6.0	7.5 ± 4.0	17.6 +5.0/-2.0	6 +5.0/-3.0	6.0 ± 2.0	0 ± 0.05	0.65 ± 0.25			7.0 +6.0/-2.0		0.7 +1.5/-0.5
Viking 1 (C7 Fines)	82Cla	44 ± 6.0	7.4 ± 4.0	19.0 +5.0/-2.0	5 +5.0/-3.0	6.0 ± 2.0	0 ± 0.05	0.63 ± 0.25			6.8 +6.0/-2.0		0.6 +1.5/-0.5
Viking 1 (C8 Fines)	82Cla	43 ± 6.0	7.1 ± 4.0	18.8 +5.0/-2.0	6 +5.0/-3.0	5.8 ± 2.0	0 ± 0.05	0.71 ± 0.25			5.9 +6.0/-2.0		0.65 +1.5/-0.5
Viking 1 (C6 Deep Fines)	82Cla	44 ± 6.0	7.3 ± 4.0	17.3 +5.0/-2.0	6 +5.0/-3.0	6.0 ± 2.0	0.04 ± 0.05	0.61 ± 0.25			6.7 +6.0/-2.0		0.8 +1.5/-0.5
Viking 2 (U1 Fines)	82Cla	42 ± 6.0		18.9 +5.0/-2.0		5.8 ± 2.0	0.03 ± 0.05	0.6 ± 0.25			8.4 +6.0/-2.0		0.3 +1.5/-0.5
Viking 2 (U2 under rock)	82Cla	43 ± 6.0		17.6 +5.0/-2.0		5.8 ± 2.0	0.02 ± 0.05	0.63 ± 0.25			8.1 +6.0/-2.0		0.6 +1.5/-0.5
Viking 2 (U3 Fines)	82Cla	44 ± 6.0		18.3 +5.0/-2.0		5.95 ± 2.0	0 ± 0.05	0.64 ± 0.25			7.6 +6.0/-2.0		-
Viking 2 (U4 under rock)	82Cla	44 ± 6.0		16.9 +5.0/-2.0		5.7 ± 2.0	0 ± 0.05	0.52 ± 0.25			7.9 +6.0/-2.0		0.45 +1.5/-0.5
Viking 2 (U6 Deep Fines)	82Cla	42 ± 6.0		17.1 +5.0/-2.0		5.5 ± 2.0	0 ± 0.05	0.48 ± 0.25			7.9 +6.0/-2.0		0.3 +1.5/-0.5
Average deep fines (Viking 1)	82Cla	44	7.3	17.5	6	5.7	<0.5	0.62			6.7		0.8
Average Deep fines (Viking 2)	82Cla	43	7*	17.3	6*	5.7	<0.5	0.54			7.9		0.4
<b>Pathfinder Soils</b>													
A-2 Deploy	03Fol	40.9 ± 0.8	10.4 ± 0.8	21.2 ± 0.9	8.7 ± 2.0	6.1 ± 0.4	0.50 ± 0.04	0.7 ± 0.2	0.9 ± 0.2	0.3 ± 0.1	6.0 ± 1.2	3.2 ± 0.7	0.7 ± 0.2
A-4 Next to Yogi	03Fol	41.0 ± 0.9	10.6 ± 0.8	20.4 ± 0.8	8.0 ± 1.9	5.6 ± 0.4	0.50 ± 0.07	1.0 ± 0.3	1.2 ± 0.2	0.4 ± 0.1	6.9 ± 1.4	3.2 ± 0.7	0.8 ± 0.2
A-5 Dark Next to Yogi	03Fol	41.7 ± 0.9	10.6 ± 0.8	21.8 ± 1.0	7.3 ± 1.6	6.2 ± 0.4	0.5 ± 0.05	0.6 ± 0.1	0.6 ± 0.1	0.5 ± 0.1	5.8 ± 1.1	3.3 ± 0.7	0.8 ± 0.2
A-9 Disturbed Soil by Scooby	03Fol	41.7 ± 0.9	10.2 ± 0.9	22.2 ± 1.0	6.4 ± 1.6	6.4 ± 0.5	0.70 ± 0.09	0.8 ± 0.2	0.8 ± 0.2	0.2 ± 0.1	6.6 ± 1.4	2.6 ± 2.4	1.2 ± 0.3
A-10 Lamb	03Fol	41.2 ± 0.9	9.7 ± 0.7	23.9 ± 1.0	7.5 ± 1.7	6.0 ± 0.4	0.4 ± 0.04	0.8 ± 0.2	0.6 ± 0.1	0.3 ± 0.1	6.3 ± 1.2	1.8 ± 0.8	0.8 ± 0.2
A-15 Mermaid	03Fol	43.2 ± 1.0	9.9 ± 0.8	23.2 ± 1.0	6.7 ± 1.6	5.5 ± 0.4	0.70 ± 0.07	0.8 ± 0.2	0.6 ± 0.1	0.3 ± 0.1	5.2 ± 1.1	2.7 ± 0.8	0.8 ± 0.2
<b>Pathfinder Indurated Soils</b>													
A-8 Scooby	03Fol	44.6 ± 1.0	10.4 ± 0.7	18.9 ± 0.8	6.3 ± 1.5	6.9 ± 0.5	0.8 ± 0.1	0.7 ± 0.2	0.5 ± 0.1	0.1 ± 0.1	5.4 ± 1.1	3.1 ± 0.8	0.9 ± 0.2
Doc													1.0 ± 1.6

Pathfinder Rocks	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	MgO	CaO	K <sub>2</sub> O	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	Cr <sub>2</sub> O <sub>3</sub>	MnO	SO <sub>3</sub>	Na <sub>2</sub> O*	Cl	H <sub>2</sub> O
A-3 Barnacle	53.9 ± 1.1	12.8 ± 0.9	16.7 ± 0.7	2.1 ± 0.5	5.7 ± 0.4	1.1 ± 0.1	0.6 ± 0.1	0.7 ± 0.1	0.1 ± 0.04	0.3 ± 0.1	2.0 ± 0.4	3.2 ± 0.5	0.5 ± 0.1	0.3 ± 1.3
A-7 Yogi	45.7 ± 1.0	10.8 ± 0.8	16.5 ± 0.7	5.1 ± 1.2	6.3 ± 0.5	0.7 ± 0.1	0.7 ± 0.2	0.5 ± 0.1	0.1 ± 0.1	0.4 ± 0.1	4.3 ± 0.9	4.7 ± 0.8	0.7 ± 0.2	3.4 ± 1.4
A-16 Wedge	47.2 ± 1.0	11.3 ± 0.8	18.3 ± 0.7	4.0 ± 0.9	6.8 ± 0.5	0.8 ± 0.1	0.7 ± 0.2	0.5 ± 0.1	0.0 ± 0.04	0.3 ± 0.1	3.0 ± 0.6	4.8 ± 1.0	0.6 ± 0.1	1.5 ± 1.5
A-17 Shark	51.5 ± 1.2	10.2 ± 0.8	15.1 ± 0.6	3.7 ± 0.9	7.3 ± 0.5	0.8 ± 0.1	0.5 ± 0.2	0.4 ± 0.1	0.1 ± 0.1	0.4 ± 0.1	1.6 ± 0.4	3.4 ± 0.8	0.5 ± 0.1	4.3 ± 1.3
A-18 Half Dome	50.0 ± 1.1	12.3 ± 0.9	17.9 ± 0.7	3.4 ± 0.8	6.0 ± 0.5	1.0 ± 0.1	0.7 ± 0.2	0.6 ± 0.1	0.1 ± 0.1	0.4 ± 0.1	3.0 ± 0.6	4.0 ± 0.7	0.7 ± 0.1	0.1 ± 1.3
<b>MER Soils</b>														
MER Spirit	46.52 ± 0.57	10.46 ± 0.71	12.18 ± 0.57	8.93 ± 0.45	6.27 ± 0.23	0.41 ± 0.03	0.87 ± 0.15	0.83 ± 0.23	0.36 ± 0.08	0.33 ± 0.02	4.90 ± 0.74	3.02 ± 0.37	0.61 ± 0.08	
"Laguna" class soil (Panda subclass)														
MER Opportunity	46.78 ± 1.22	9.67 ± 0.49	13.75 ± 1.00	7.31 ± 0.30	7.12 ± 0.28	0.49 ± 0.07	1.02 ± 0.18	0.82 ± 0.05	0.41 ± 0.08	0.38 ± 0.02	4.97 ± 0.58	2.23 ± 0.23	0.57 ± 0.06	
"Laguna" class soil (Panda subclass)														
<b>MER Rocks</b>														
MER Spirit	45.9	10.6	18.7	9.9	7.9	0.15	0.58				1.7	2.6	0.3	
"Adirondack," (consistent with picritic basalts)														
MER Spirit	49.4	13.1	13.2	8.3	6	1.02	0.93				1.8	4	0.4	
"Backstay," (least altered rock in Columbia Hills)														
Adirondack	45.7	10.9	15.6	10.8	7.75	0.07	0.48	0.52	0.61	0.41	1.23	2.41	0.2	3.55
08Mor	45.9	10.7	15.6	10.4	7.84	0.1	0.55	0.56	0.6	0.41	1.28	2.54	0.26	3.55
Humphrey	45.8	10.7	17	9.72	8.02	0.16	0.59	0.65	0.54	0.42	1.48	2.78	0.23	2.1
Muzatzal	44.8	10.8	15.9	8.67	7.83	0.23	0.59	0.74	0.53	0.39	4.2	2.88	0.55	1.4
Route 66	47	8.29	12.3	10.6	6.03	0.68	1.06	0.97	0.2	0.36	2.37	2.68	0.45	7.68
Irvine	47.9	8.4	11.9	8.45	5.57	0.52	1.05	0.91	0.2	0.38	2.36	3.4	0.47	9.2
Esperanza	43.8	15	6.96	4.5	8.89	0.57	2.59	5.19	0	0.22	2.2	4.98	0.35	5.16
Wishstone	43.5	14.8	6.88	3.98	8.75	0.53	2.96	5.05	0	0.25	1.96	5.02	0.6	6.25
Chapagne	49.5	13.3	10.7	8.31	6.04	1.07	0.93	1.39	0.15	0.24	1.52	4.15	0.35	3.44
Backstay	39.7	8.49	16.4	11.2	6.4	0.54	1.19	2.89	0.19	0.37	4.8	2.78	0.93	4.56
Larry's Bench	44.1	7.72	14.7	12.4	4.66	0.66	0.61	0.91	0.39	0.36	4.65	2.98	1.24	5.15
Seminole														
Abiaka	40.6	4	18.9	22.3	2.61	0.12	0.35	0.63	0.87	0.38	4.32	1.59	0.87	2.59
Algonquin	41.3	2.93	17.6	24.8	1.93	0.04	0.25	0.45	0.71	0.43	2.69	1.12	0.61	5.53
Comanche														
Palomino	45.4	9.31	7.54	9.48	6.65	0.42	1.01	1.37	0.32	0.32	4.81	3.5	1.94	8.73
Posey	46	9.3	8.11	9.59	6.5	0.21	0.93	1.12	0.39	0.31	3.75	3.25	1.74	9.77
Cool PapaBell														
Stars	46.6	9.98	7.39	10.3	6.74	0.32	1.11	1.27	0.34	0.29	2.91	3.36	1.35	8.9
Cool PapaBell Crawford														

SNC Meteorites	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	MgO	CaO	K <sub>2</sub> O	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	Cr <sub>2</sub> O <sub>3</sub>	MnO	S	Na <sub>2</sub> O	H <sub>2</sub> O
ALH 77005	98Lod	42.4 ± 0.9	2.87 ± 0.28	20.1 ± 0.4	28.2 ± 1.3	3.16 ± 0.32	0.030 ± 0.005	0.39 ± 0.07	0.40 ± 0.04	0.98 ± 0.08	0.45 ± 0.01	0.051 ± 0.02	0.47 ± 0.07
EET 79001 A	98Lod	49.9 ± 0.9	5.91 ± 0.60	18.4 ± 0.8	16.1 ± 0.8	7.26 ± 0.32	0.040 ± 0.007	0.70 ± 0.12	0.60 ± 0.07	0.62 ± 0.04	0.48 ± 0.02	0.21 ± 0.07	0.86 ± 0.05
EET 79001 B	98Lod	49.4 ± 0.4	11.2 ± 1.4	17.4 ± 0.7	6.57 ± 1.09	10.8 ± 0.33	0.075 ± 0.008	1.18 ± 0.09	1.28 ± 0.04	0.17 ± 0.02	0.43 ± 0.03	0.193 ± 0.002	1.74 ± 0.14
LEW 88516	98Lod	46.0 ± 0.4	3.31 ± 0.43	19.0 ± 1.2	25.0 ± 0.9	4.20 ± 0.28	0.029 ± 0.004	0.39 ± 0.06	0.39	0.86 ± 0.06	0.49 ± 0.02	0.095	0.56 ± 0.08
Shergotty	98Lod	51.3	6.88 ± 0.51	19.4 ± 0.7	9.3 ± 0.2	9.60 ± 0.55	0.17 ± 0.02	0.82 ± 0.07	0.67 ± 0.14	0.20 ± 0.02	0.52 ± 0.02	0.13 ± 0.08	1.39 ± 0.19
QUE 94201	98Lod	47.9	11.0 ± 1.1	18.5 ± 0.5	6.25 ± 0.07	11.4 ± 0.2	0.045 ± 0.010	1.84 ± 0.15	-	0.14 ± 0.01	0.45 ± 0.02	-	1.58 ± 0.26
Y793605 Zagami	98Lod	45.4	2.32	19.7	26.2	4.06	0.025	0.35	-	1.01	0.48	-	0.36
ALH 84001	98Lod	50.5 ± 0.4	6.05 ± 0.38	18.1 ± 0.5	11.3 ± 0.7	10.5 ± 0.6	0.14 ± 0.01	0.79 ± 0.04	0.50 ± 0.07	0.33 ± 0.04	0.50 ± 0.04	0.19	1.23 ± 0.06
G. Valadares Lafayette	98Lod	52.8 ± 0.1	1.29 ± 0.10	17.5 ± 0.5	25.0 ± 0.8	1.82 ± 0.38	0.017 ± 0.006	0.21 ± 0.01	0.014	1.14 ± 0.10	0.46 ± 0.01	0.011	0.14 ± 0.03
Nakhla	98Lod	49.5	1.74	19.7	10.9	12.9 ± 4.3	0.29 ± 0.21	0.35	-	0.21	0.67	-	0.82
Chassigny	98Lod	46.9	2.47 ± 1.32	21.6 ± 2.2	12.9	13.4 ± 0.7	0.11 ± 0.02	0.42 ± 0.13	0.45	0.19 ± 0.01	0.50 ± 0.01	0.04 ± 0.002	0.40 ± 0.05
		48.6 ± 1.7	1.68 ± 0.21	20.6 ± 1.5	12.1 ± 0.4	14.7 ± 0.7	0.13 ± 0.02	0.34 ± 0.04	0.13 ± 0.04	0.26 ± 0.04	0.49 ± 0.04	0.026 ± 0.008	0.46 ± 0.07
		37.4 ± 1.1	0.72 ± 0.30	27.3 ± 0.8	31.8 ± 0.8	0.66 ± 0.10	0.036 ± 0.013	0.08 ± 0.02	0.071 ± 0.03	0.77 ± 0.15	0.53 ± 0.11	0.026 ± 0.013	0.12 ± 0.02
													0.07 ± 0.01
Selected terrestrial igneous rocks	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	MgO	CaO	K <sub>2</sub> O	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	Cr <sub>2</sub> O <sub>3</sub>	MnO		Na <sub>2</sub> O	H <sub>2</sub> O
Peridotite	44.2	2.05	7.54	42.21	1.92	0.06	0.13	0.03		0.13		0.27	
Tholeiitic basalt	48.77	15.9	8.62	9.67	11.16	0.08	1.15	0.09		0.17		2.43	0.3
(morb)													
Alkali basalt	47.52	15.95	8.91	5.18	8.96	1.29	3.29	0.64		0.19		3.56	1.16
OIB													
Andesite	59.89	17.07	3	3.25	5.67	2.47	0.95	0.31		0.12		3.95	
Metalluminous	67.89	14.49	2.57	1.75	3.78	3.05	0.45	0.11		0.08		2.95	
Granite													
Peraluminous	69.08	14.3	3.23	1.82	2.49	3.63	0.55	0.13		0.06		2.2	
Granite													
Peralkaline	70.87	14.78		0.1	0.34	4.19	0.1	0.02		0.06		6.47	0.33
Granite													