

Table 4.--Analyses of Tiva Canyon Member and tuff of Chocolate Mountain of Paintbrush Tuff

[Major oxide analyses 1, 2, 6, and 10 by D. F. Powers; 3, 4, 12, and 13 by P. L. D. Elmore, S. D. Botts, G. W. Chloce, Lowell Artis, and H. Smith; 9 and 11 by C. L. Parker. Minor-element analyses 1-3, 6, and 9-13 by J. C. Hamilton; 7 and 8 from Cornwall (1962, table 2). Leaders, ---, no analyses made or constituent was absent.]

Sample localities (figure 2)	Tiva Canyon Member								Tuff of Chocolate Mountain						
	Densely welded crystallized tuff		Vitrophyre		Vitrophyre		Densely welded crystallized tuff		Vitrophyre		Densely welded crystallized tuff		Vitrophyres		Densely welded crystallized tuff
	1	2	3	4	5	6	7	8	9	10	11	12	13		
Field no.	SC-3 C	AGE-4	59-ENN-60	TM 7091	MC-299	To 42 R	MC-274C	MC-274B	WH 1A	SC-3A	XR-1	62L-178-B	62L-178-A		
Chemical laboratory no.	13846	13849		160679		I4071			I4191	13845		161299	161300		
Spectrographic laboratory no.	13846	13849		303629		I4071			I4191	13845	I4190	D11078W	D11078W		
A. Major oxides (weight percent), recalculated without H ₂ O, F, Cl, and CO ₂ as CaCO ₃															
SiO ₂	69.82	70.56	72.9	73.1	76.13	76.14	76.30	76.62	76.64	76.71	68.63	71.6	71.2		
Al ₂ O ₃	15.86	15.45	14.9	14.4	12.96	12.71	12.77	12.72	12.70	12.69	16.11	15.0	15.4		
Fe ₂ O ₃	2.02	1.80	1.3	1.0	.76	1.01	1.01	.77	.96	1.02	1.60	1.6	1.2		
FeO } Sum as FeO	.00	.09	.05	.48	.24	.02	.00	.24	.09	.07	.66	.34	.59		
MgO	.43	.29	.20	.34	.32	.12	.13	.13	.11	.11	.56	.53	.45		
CaO	.86	.77	.48	.76	.33	.51	.24	.52	.18	.11	1.69	1.0	1.0		
Na ₂ O	4.44	4.87	3.4	3.8	3.81	4.42	4.41	3.76	4.33	4.37	4.35	4.2	4.3		
K ₂ O	5.92	5.59	6.3	5.6	5.15	4.75	4.82	4.99	4.74	4.65	5.70	5.1	5.2		
TiO ₂	.46	.40	.31	.28	.16	.14	.18	.15	.14	.15	.48	.34	.33		
P ₂ O ₅	.07	.07	.04	.04	.03	.07	.02	.01	.01	.01	.11	.11	.10		
MnO	.11	.11	.12	.12	.10	.11	.10	.09	.09	.10	.11	.12	.12		
Total	99.99	100.00	100.00	99.92	99.99	100.00	99.98	100.00	99.99	99.99	100.00	99.94	99.89		
B. Minor elements (weight percent)															
B	<0.003	<0.003	--	0.002	0.001	0.002	0.001	0.001	0.003	<0.003	<0.002	<0.002	<0.002		
Ba	.1	.15	--	.03	.0049	.01	.0058	.0042	.01	.007	.5	.3	.2		
Be	<.0001	<.0001	--	.0003	.0003	.0003	.0004	.0005	.0005	.0003	.0002	.0002	.0002		
Ce	<.03	<.03	--	<.02	<.02	<.02	<.02	<.02	<.02	<.02	.05	.02	.02		
Co	<.0005	<.0005	--	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005		
Cr	.00015	.0001	--	<.0001	<.0001	<.0001	<.0001	<.0001	.0002	.00015	.0002	.0001	.0001		
Cu	.0002	.00015	--	.002	.00008	.00015	.00009	.00004	.0002	.00015	.0003	.0005	.001		
Ga	.002	.002	--	.003	.0021	.002	.0022	.002	.003	.002	.003	.003	.003		
La	.015	.015	--	.007	.003	<.002	.003	.004	.005	<.002	.02	.01	.01		
Mo	<.0005	<.0005	--	.0005	.0003	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005		
Nb	<.001	<.001	--	.002	.0030	.002	.0032	.0028	.003	.0015	.0015	.0015	.0015		
Nd	.015	.015	--	<.01	<.01	<.01	<.01	<.01	<.01	<.01	.015	.015	.015		
Ni	<.0003	<.0003	--	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003	<.0003		
Pb	.002	.0015	--	.003	.0053	.003	.0044	.0044	.005	.002	.003	.003	.003		
Sc	.0007	.0005	--	.0005	<.0005	<.0005	<.0005	<.0005	<.0005	<.0005	.001	.0007	.0007		
Sr	.02	.02	--	.015	.0014	.005	.0015	.0040	.003	.003	.07	.05	.02		
V	.0015	.0015	--	<.001	<.001	.0015	<.001	<.001	<.001	<.001	.003	.0015	.0015		
Y	.003	.003	--	.005	.0060	.005	.0060	.0066	.005	.003	.005	.003	.003		
Yb	.0003	.0003	--	.0005	.00051	.0005	.00051	.00050	.0005	.0003	.0005	.0003	.0003		
Zr	.02	.02	--	.05	.024	.01	.023	.024	.01	.01	.05	.05	.03		
C. Norms (weight percent), from recalculated analyses															
Quartz	19.1	19.0	27.5	27.2	33.2	31.7	31.7	34.4	32.8	33.1	17.4	24.9	23.8		
Orthoclase	35.0	33.0	37.5	33.2	30.4	28.1	28.6	29.5	28.0	27.5	33.7	29.9	30.5		
Albite	37.6	41.2	29.0	32.5	32.2	37.5	37.4	31.8	36.6	36.9	36.8	35.9	36.6		
Amorphite	3.8	3.3	2.0	3.5	1.5	.8	.8	2.5	.8	.5	7.6	4.3	4.4		
Corundum	.8	.2	1.6	.7	.6	.0	.0	.2	.1	.3	.0	.9	1.1		
Enstatite	1.1	.7	.5	.9	.8	.3	.3	.3	.0	.0	.0	.0	.0		
Ferrosilite	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1	1.1	.5	1.3		
Magnetite	.0	.0	.0	1.1	.7	.02	.0	.7	.8	.9	.8	1.3	.3		
Hematite	2.0	1.8	1.4	.3	.3	1.0	1.0	.3	.3	.3	.9	.7	.6		
Ilmenite	.2	.4	.4	.5	.3	.3	.2	.3	.0	.0	.0	.0	.0		
Rutile	.3	.2	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0		
Apatite	.2	.2	.1	.1	.1	.2	.05	.03	.02	.02	.3	.3	.2		
Total	100.10	100.00	100.10	100.00	99.80	99.92	100.05	100.03	99.92	99.92	100.00	100.00	99.90		
D. Minerals (volume percent)															
Quartz	--	--	--	--	tr.	--	.1	--	--	--	--	0.2	tr.		
Alkali feldspar	14.2	10.8	--	--	2.1	2.8	4.3	5.0	2.1	1.6	--	10.7	11.8		
Plagioclase	.9	1.5	--	--	tr.	tr.	--	--	tr.	tr.	--	3.3	5.0		
Biotite	.2	.5	--	--	--	.1	--	--	--	--	--	0.4	0.5		
Clinopyroxene	.2	.2	--	--	--	--	--	--	--	--	--	0.1	0.2		
Hornblende	--	tr.	--	--	.3	tr.	.3	.1	tr.	tr.	--	tr.	tr.		
Sphene	tr.	tr.	--	--	--	.1	--	--	tr.	tr.	--	tr.	tr.		
Opques	.3	.4	--	--	.1	tr.	.1	.1	.1	.1	--	0.3	0.5		
Groundmass	84.2	86.6	--	--	97.5	97.0	96.2	94.8	97.8	98.3	--	82.1	81.0		
Xenoliths	--	--	--	--	--	--	--	--	--	--	--	2.1	0.2		
Modal points counted	1953	1011				7267	1000	1000	9620	6000		3560	1310		
E. Major oxides (weight percent), original analyses															
SiO ₂	67.12	69.85	70.1	70.3	72.99	74.61	75.02	73.27	76.09	76.03	66.00	70.8	69.2		
Al ₂ O ₃	15.25	15.30	14.3	13.8	12.43	12.45	12.56	12.16	12.61	12.58	15.49	14.8	15.0		
Fe ₂ O ₃	1.94	1.78	1.3	1.0	.73	.99	.99	.74	.95	1.01	1.54	1.6	1.2		
FeO	.00	.09	.08	.46	.23	.02	.00	.23	.09	.07	.63	.34	.57		
MgO	.41	.29	.19	.33	.34	.12	.13	.12	.11	.11	.54	.52	.44		
CaO	2.02	.76	.44	.73	.33	1.04	.78	.50	.20	.13	1.65	1.0	1.0		
Na ₂ O	4.27	4.82	3.3	3.7	3.65	4.33	4.34	3.60	4.30	4.33	4.18	4.2	4.2		
K ₂ O	5.69	5.53	6.1	5.4	4.94	4.65	4.74	4.77	4.71	4.61	5.48	5.0	5.0		
H ₂ O+ } Loss on ignition	.51	.15			3.04	.13	.36	2.95	.21	.27	2.91	.92	2.9		
H ₂ O- } Loss on ignition	.69	.16			.64	.28	.18	1.07	.21	.21	.48	.40	.28		
TiO ₂	.44	.40	.29	.27	.15	.14	.15	.14	.14	.15	.46	.34	.32		
P ₂ O ₅	.07	.07	.04	.04	.03	.07	.02	.01	.01	.01	.11	.11	.10		
MnO	.11	.11	.12	.12	.10	.11	.10	.09	.09	.10	.11	.12	.12		
CO ₂	.94	.00	<.05	<.05	.04	.54	.43	.01	.02	.02	.02	<.05	<.05		
Cl	.01	.02	--	--	--	.01	--	--	.02	.02	.03	--	--		
F	.05	.06	--	--	.11	.02	--	--	.03	.03	.06	--	--		
Subtotal	99.52	99.39			99.75	99.51	99.80	99.66	99.79	99.68	99.69				
Less oxygen	.02	.03			.05	.01			.01	.01	.03				
Total	99.50	99.36	100.11	100.40	99.70	99.50	99.80	99.66	99.78	99.67	99.66	100	100		
Powder density	--	--	--	--	2.40	--	2.62	2.37	--	--	--	2.54	2.45		

a--Also found: 0.004 Li.

tr--Trace