Electronic supplement 25-2-01

to the paper

Heterogeneous magmas of the Quaternary Sierra Chichinautzin volcanic field (central Mexico): the role of an amphibole-bearing mantle and magmatic evolution processes

by

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- A5: Representative analyses of oxide
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This electronic supplement contains 10 pages.

Samula.	4 37	MV16	MV01	MV44	שני	TEB	MV47	MV61	9EAM	MV30.7	MVD7	10
Locality:	Tezoyuca	Cuautl	Chapultepec	Esperanza	Pelagatos	Tenango	Lagunilla	Lama	Capulhuac	Cuate Grande	Villa Metepec	Sta. Cruz
Latitude N:	$18^{\circ}48'40''$	19°09`55"	19°12'27"	19°05'35''	19°06'00"	19°06'41.9''	19°04'31"	19°05'31"	19°11'52''	19°11'23"	19°14'58"	19°10'18"
Longitude W:	99°12'36"	99°25'30"	99°33'14"	99°26'02"	99°50'00"	99°37'49.4"	99°23`56"	99°31'46"	99°27'21"	99°26'20"	99°46'30"	99°29`44"
Altitude (m):	1,225	2,880	2,590	2,880	1,243	2,640	2,820	2,630	2,710	2,730	2,690	2,612
Affinity:	$H-TiO_2$	$H-TiO_2$	$H-TiO_2$	$H-TiO_2$	$L-TiO_2$	$L-TiO_2$	$L-TiO_2$	$L-TiO_2$	Transitional	Transitional	Transitional	H-K ₂ O
Rock type:	В	А	Α	D	BA	А	А	Υ	BA	В	А	BTA
Ol Ph	7.1	6.0	2.0	ı	12.8	0.1	0.7	0.7	8.4	7.9	3.5	ı
OI MPh	0.8	·	0.1		1.0	tr			0.9		1.1	
Cpx Ph		1.9	6.1	2.2	1.0	tr	3.1	0.2	0.7	2.5		12.1
Cpx Mph		0.2		0.4	0.1		0.2	tr	0.2			1.5
Opx Ph	0.4	0.3	1.9	0.7	·	0.1	2.0	1.4				·
Opx Mph			0.5	0.2			0.1					
Xeno Qz			ı		·	3.7		5.4			1.5	·
Xeno Plg		9.0	ı			1.3		1.8				
Xeno Cpx/Anp			ı		·	2.8		2.9				·
Plg MPh	13.2	12.5	17.0	1.9	13.6	21.1	4.4	11.0	8.6	13.1	4.7	
Gdm	78.5	78.5	72.3	94.6	71.5	70.9	89.5	76.6	81.2	76.6	89.2	86.4
Tot	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Vescicles	9.0	33.0	13.2	7.4	1.4	11.3	9.6	11.2	9.0	26.6	10.2	8.4
Ph = phenocryst (trachy-andesite, I	(>0.3 mm), MP D: dacite. OI: ol	h = microphene ivine, Cpx: clir	ocrysts (>0.03 mn 10pyroxene, Opx:	n), Gdm = grour orthopyroxene.	1 c0.03	nm). Qz: quartz,	Plg: plagioclase	e, Amp: amphib	ole. A: andesite,	B: basalt, BA: ŀ	asaltic andesite,	BTA = basaltic

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Sample:	d-37	d-37	d-37	d-25	d-25	d-25	d-25	Sc08	Sc08	Sc08	Mx84	Mx84	d-53	d-53	d-53
Locality: Affinity	Tezoyuca H-TiO 2	Tezoyuca H-TiO 2	Tezoyuca H-TiO ₂	Pelagatos L-TiO ₂	Pelagatos L-TiO ₂	Pelagatos L-TiO ₂	Pelagatos L-TiO ₂	Tenango L-TiO ₂	Tenango L-TiO ₂	Tenango L-TiO ₂	Tepexingo L-TiO ₂	Tepexingo L-TiO ₂	Capulhuac Trans.	Capulhuac Trans.	Capulhuac Trans.
Texture	Ph Core	Ph Core	Ph Rim	Ph Core	Ph Core	Ph Rim	Gdm	Ph Core	Ph Core	Gdm	Ph Core	Ph Core	Ph Core	Ph Core	Gdm
Mineral	0I	01	0	01	IO	IO	0I	IO	OI	0I	0I	IO	IO	IO	01
SiO_2	40.1	40.7	40.4	40.7	40.9	41.2	42.1	40.2	39.6	37.5	40.2	40.4	40.2	39.6	39.0
TiO_2	0.01	lbd	0.02	lbd	lbd	0.03	lbdl	lbd	lbd	0.01	0.02	0.03	0.04	lbdl	0.09
Al_2O_3	0.26	lbd	0.04	0.04	0.03	lbdl	0.03	lbd	0.04	lbdl	lbd	0.04	lbd	lbdl	0.06
Cr_2O_3	0.18	0.04	0.02	0.01	0.01	0.04	0.02	lbd	lbd	lbdl	0.03	lbdl	0.02	lbdl	lbd
FeO	12.3	12.9	14.2	12.0	13.3	13.3	15.1	13.2	16.6	30.2	15.3	13.1	12.1	17.5	19.2
MnO	0.18	0.14	0.21	0.17	0.20	0.23	0.20	0.16	0.22	0.44	0.20	0.17	0.16	0.26	0.41
NiO	0.40	0.42	0.18	0.42	0.19	0.16	0.10	0.34	0.11	0.12	0.09	0.08	0.44	0.31	0.09
MgO	46.9	46.8	45.5	47.9	47.5	44.5	44.2	47.42	44.6	32.7	45.3	46.6	48.1	44.4	42.0
CaO	0.16	0.16	0.20	0.13	0.15	0.13	0.11	0.10	0.14	0.18	0.12	0.08	0.12	0.15	0.29
Forsterite	86.8	86.3	84.6	87.4	86.1	85.3	83.6	86.2	82.5	65.4	83.7	86.1	87.4	81.5	78.9
Fayalite	12.8	13.4	14.9	12.3	13.5	14.3	16.0	13.5	17.1	33.9	15.9	13.6	12.3	18.0	20.2
Larnite	0.20	0.20	0.30	0.20	0.20	0.20	0.10	0.13	0.18	0.26	0.16	0.11	0.20	0.20	0.40
Tephroite	0.20	0.10	0.20	0.20	0.20	0.30	0.20	0.17	0.22	0.50	0.21	0.18	0.20	0.30	0.40
Mg# (bulk rock)	67.1	67.1	67.1	73.7	73.7	73.7	73.7	65.6	65.6	65.6	62.5	62.5	70.9	70.9	70.9
Trans.: Tran	sitional; Ph:	phenocryst, (Gdm: ground	mass; bdl: bel	ow detection	limit.									

Table A2. Selected analyses of olivine (OI) in samples from the western Sierra Chichinautzin volcanic field plus Pelagatos and Tezoyuca cinder cones.

Meriggi et al., 2008, Revista Mexicana de Ciencias Geológicas, 25(2), 197-216

Sample Locality:	d-37 Tezoyuca	d-37 Tezoyuca	d-37 Tezoyuca	TEB Tenango	TEB Tenango	TEB Tenango	Mx53 Tenango	Sc02 Tenango	Sc05 Tenango	Mx39.2 Los Cuates	Mx39.2 Los Cuates	Mx39.2 Los Cuates	d-10 Sta. Cruz	d-10 Sta. Cruz	L2 Lama	L2 Lama
Affinity Mineral Texture	H-TiO ² Cpx Ph core	H-TiO , Cpx Ph core	H-TiO , Cpx Ph rim	L-TiO, Cpx Ph core	L-TiO ² Cpx Ph core	L-TiO 2 Cpx Qz rim	L-TiO , Cpx Qz rim	L-TiO2 Opx Ph core	L-TiO ₂ Opx Ph core	Trans. Cpx Ph core	Trans. Cpx Ph core	Trans. Cpx Ph rim	H-K₂O Cpx Ph core	H-K₂O Cpx Ph rim	dome Xenolith Opx Ph core	dome Xenolith Cpx Ph core
SiO ₂	48.03	49.29	46.70	53.6	53.4	53.8	52.7	55.5	52.3	51.8	50.8	49.9	53.4	49.3	48.3	53.1
TiO ₂	2.89	1.82	3.10	0.26	0.71	0.17	0.41	0.16	0.59	0.75	1.10	1.34	0.27	1.20	0.50	0.26
Al_2O_3	3.77	4.02	5.11	1.59	3.03	0.41	0.46	1.82	0.87	2.81	3.19	3.93	1.29	5.02	7.83	0.71
Cr_2O_3	0.17	0.13	0.30	lbd	0.08	lbd	0.02	0.56	bdl	0.16	0.43	0.05	0.07	lbd	lbd	lbd
FeO	9.91	11.09	9.85	7.76	10.5	8.36	10.4	8.41	19.4	6.26	7.55	7.93	5.29	8.44	20.0	12.0
MnO	0.22	0.32	0.24	0.21	0.22	0.16	0.31	0.18	0.56	0.15	0.18	0.13	0.09	0.16	0.63	0.38
MgO	13.11	15.59	13.04	18.28	13.5	16.56	14.8	31.5	22.4	16.9	15.4	15.1	17.7	13.9	22.7	14.8
CaO	21.14	16.41	20.24	17.22	17.88	19.4	20.0	1.40	3.32	20.7	21.16	21.0	20.9	21.3	0.58	18.9
Na_2O	0.39	0.61	0.52	0.25	0.64	0.39	0.42	0.12	0.03	0.25	0.43	0.48	0.28	0.42	lbd	0.37
K_2O	bdl	0.08	0.02	lbd	0.36	0.03	0.04	0.02	lbdl	bdl	0.03	0.20	lbd	0.04	0.30	0.03
Enstatite	38.6	46.2	39.2	52.0	41.8	47.0	42.0	84.4	62.2	47.8	44.0	43.5	49.5	40.9	65.5	42.0
Ferrosilite	16.7	19.0	17.0	12.7	18.5	13.6	17.1	12.9	31.2	10.2	12.4	13.0	8.40	14.2	33.3	19.6
Wollastonite	44.7	34.9	43.8	35.2	39.7	39.5	40.9	2.70	6.64	42.0	43.6	43.5	42.1	44.9	1.20	38.4
Mg#	0.70	0.71	0.70	0.80	0.69	0.80	0.78	0.87	0.67	0.80	0.78	0.80	0.85	0.70	0.70	0.70
Trans.: Transit	tional; Ph: p	henocryst, C)z: quartz, ł	below de	etection limi	it.										

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Sample	Mx39.2	Mx39.2	Sc05	Mx84	Mx84	Mx84	Sc08	L2	L2
Locality	Los Cuates	Los Cuates	Tenango	Tepexingo	Tepexingo	Tepexingo	Tenango	Lama dome	Lama dome
Affinity	Transitional	Transitional	L-TiO ₂	L-TiO ₂	L-TiO ₂	L-TiO ₂	Xenocryst	Xenocryst	Xenocryst
Mineral	Plg	Plg	Plg	Plg	Plg	Plg	Plg	Plg	Plg
Texture	Gdm (core)	Gdm (core)	Gdm (core)	Gdm (core)	Gdm (rim)	Gdm (rim)	Ph core	Ph core	Ph core
SiO ₂	51.7	52.1	53.6	53.7	54.3	55.8	61.2	60.0	59.2
Al ₂ O ₃	30.0	29.4	30.4	28.3	29.1	27.6	25.3	25.1	25.4
Fe ₂ O ₃	1.00	1.20	0.87	0.72	0.72	1.27	0.74	0.13	0.60
MgO	0.17	0.11	0.09	0.00	0.07	nd	0.00	0.04	0.07
CaO	12.8	12.1	12.4	11.7	10.7	10.0	6.09	6.71	6.79
Na ₂ O	3.99	4.39	4.24	4.79	4.95	5.61	7.91	7.67	6.91
K ₂ O	0.25	0.36	0.27	0.24	0.26	0.36	0.46	0.43	1.19
SrO	0.25	0.17	0.23	nd	nd	nd	0.08	0.10	0.09
BaO	0.03	bdl	0.03	nd	nd	nd	0.07	bdl	0.04
Albite	35.6	38.9	37.6	42.0	44.86	49.3	68.3	65.8	60.4
Anorthite	62.9	59.0	60.7	56.7	53.59	48.6	29.1	31.8	32.8
Orthoclase	1.50	2.10	1.58	1.38	1.55	2.06	2.66	2.40	6.8

Table A4. Representative analyses of plagioclase (Plg) in samples from the western Sierra Chichinautzin volcanic field.

Ph: phenocryst, Gdm: groundmass, bdl: below detection limit, nd: not determined.

Table A5. Representative analyses of oxide in samples from the western Sierra Chichinautzin volcanic field.

Sample	Mx39.2	Mx39.2	d-37	d-37	d-25	d-25	Sc05	Sc05	L2	L2
Locality:	Los Cuates	Los Cuates	Tezoyuca	Tezoyuca	Pelagatos	Pelagatos	Tenango	Tenango	Lama dome	Lama dome
Affinity	Trans.	Trans.	H-TiO ₂	H-TiO ₂	L-TiO ₂	L-TiO ₂	L-TiO ₂	L-TiO ₂	Xenolith	Xenolith
Mineral	Mg-Chr	Mg-Chr	Mg-Chr	Mg-Chr	Mg-Chr	Mg-Chr	Ilm	Mt	Sp	Sp
Texture	In Olv	In Olv	In Olv	In Olv	In Olv	In Olv	Gdm	Gdm	Gdm	Gdm
SiO ₂	0.16	0.03	0.19	0.07	0.07	0.06	0.03	0.14	0.09	0.13
TiO ₂	1.36	0.97	1.19	1.24	0.57	0.55	44.9	13.2	0.49	0.26
Al ₂ O ₃	15.5	19.4	23.4	26.4	15.2	17.6	0.25	1.19	58.4	60.21
Cr ₂ O ₃	35.0	38.5	32.9	32.5	45.4	43.8	0.05	0.08	0.04	0.10
FeO	34.7	23.4	23.9	24.2	25.9	21.6	50.2	80.4	26.3	27.9
MnO	0.28	0.20	0.17	0.17	0.27	0.35	0.41	0.40	0.34	0.20
NiO	0.15	0.05	0.26	0.29	nd	nd	nd	nd	bdl	0.05
MgO	11.8	15.3	14.15	13.7	11.1	12.8	2.73	0.89	12.7	10.7
CaO	0.19	bdl	0.02	bdl	bdl	0.03	0.14	0.19	0.03	0.04
ZnO	0.10	0.30	bdl	bdl	bdl	0.12	0.15	bdl	bdl	0.68
Sum	99.31	98.15	96.15	95.53	98.57	96.84	98.86	96.44	94.41	100.38
Fe ₂ O ₃	19.4	12.9	11.1	9.34	9.34	7.79	-	42.8	5.18	3.52
Cr#	0.60	0.57	0.49	0.45	0.67	0.63	0.12	-	-	-
ILM'	-	-	-	-	-	-	83.7	-	-	-
HEM'	-	-	-	-	-	-	16.3	-	-	-
USP'	-	-	-	-	-	-	-	37.6	-	-
MT'	-	-	-	-	-	-	-	62.4	-	-

Trans.: Transitional; Gdm: groundmass, bdl: below detection limit, nd: not determined, Mg-Chr: Mg-chromite, Ilm: ilmenite, HEM: hematite, USP: ulvöspinel, Mt: magnetite, Sp: spinel.

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Samule	MX01	CUXW	MX03	MX05	MX07	0XM	MX09a	MX11	MX15	MX17	MX18	CCXM	MX23	MX 24
Locality	Chapultepec	Chapultepec	Chapultepec	Chapultepec	Villa	Villa	Villa	Sta. Cruz	Cuautl	Tomasquillo	Negro	Negro	Negro	La Mesa
					Metepec	Metepec	Metepec	201101001						
Lat N Long W	19°12'21'' 99°33'14''	19°12'29" 99°33'40"	19°12'19" 99°33'34"	19°12'20' 99°33'14''	19°14`38" 99°46'30"	99°36'10"	19°14`28" 99°36'10"	19°10'18" 99°29'44"	19°09`25'30"	99°23'30"	19°09'32" 99°23'50"	19°09'4/'' 99°22'36''	19°10'12'' 99°22'56''	19°09°24'27"
Altitude (m)	2590	2580	2640	2600	2690	2710	2710	2610	2880	3050	2870	3040	3010	2810
Rock type	A	A	A	BA	A	BA	BA	BTA	A	BA	ΒA	BTA	BTA	ΒA
Affinity	H-TiO ₂	$H-TiO_2$	$H-TiO_2$	H-TiO ₂	Trans.	Trans.	Trans.	H-K ₂ O	H-TiO ₂	H-TiO ₂	H-TiO ₂	H-TiO ₂	H-TiO ₂	$H-TiO_2$
SiO,	60.3	61.8	59.9	54.9	56.8	56.1	55.9	55.1	60.8	53.1	54.9	53.3	54.0	52.5
TiO,	0.87	06.0	0.89	1.34	1.10	1.10	1.08	1.05	0.85	1.54	1.33	1.58	1.56	1.53
$Al_2\tilde{O}_3$	16.1	15.9	16.8	16.4	16.0	16.1	16.1	14.3	16.1	16.3	16.9	16.2	16.2	16.5
Fe_2O_3	2.14	2.28	2.32	2.89	6.52	3.06	2.36	3.60	1.48	4.71	1.76	3.68	3.22	8.65
FeO	3.60	3.12	3.40	5.12	1.20	4.76	4.92	2.68	3.88	4.72	5.44	5.08	5.20	1.01
MnO	0.10	0.09	0.10	0.14	0.12	0.13	0.12	0.11	0.09	0.15	0.13	0.15	0.14	0.15
MgO	4.47	3.66	3.76	5.97	5.80	6.08	6.57	6.01	4.28	5.91	5.63	6.24	6.11	6.04
CaO	5.79	5.75	6.37	7.13	6.95	6.77	6.79	9.12	5.68	7.82	6.99	7.55	7.48	7.81
Na_2O	3.50	3.90	3.57	4.11	3.76	3.70	4.04	3.50	3.42	3.97	4.11	4.04	4.10	3.90
K_2O	1.97	1.96	2.12	1.19	1.36	1.43	1.40	3.21	2.16	1.07	1.34	1.34	1.40	0.97
P_2O_5	0.15	0.20	0.18	0.25	0.18	0.18	0.17	0.81	0.16	0.27	0.40	0.42	0.41	0.28
LOI	1.03	0.48	0.56	0.57	0.19	0.64	0.57	0.50	1.09	0.50	1.00	0.48	0.16	0.66
Mg#	62.9	59.8	59.0	61.9	63.2	62.9	66.2	68.0	63.3	58.0	62.7	60.9	61.3	59.0
Λ	116	128	132	135	127	130	132	152	118	153	145	150	144	137
Cr.	182	101	101	269	316	343	315	192	176	289	198	310	287	259
Co	19	18	17	32	31	34	34	24	21	37	29	32	31	39
Ņ	89	51	48	87	158	157	146	123	91	80	72	131	109	82
Cu	27	31	26	44	31	40	40	48	27	44	32	30	34	43
Zn	<i>LT</i>	71	74	86	80	79	79	101	76	92	80	94	91	92
Rb	56	4	47	25	42	44	44	60	55	20	23	24	26	16
Sr	608	715	723	638	559	562	555	1807	595	702	662	780	771	685
Υ	15	15	14	25	22	23	22	30	17	28	26	32	26	27
Zr	181	164	167 	184	169	171	168	216	180	176	193	238	230	173
QN ;		L	~	13	× [~ ; ~	×	10	L .	16	14	20	17	14
Ba '	462	445 00	413	414	5//	504 21	5/5	0697	468	597 01	514 20	012 022	607	424
La	77	70	54	77	1.1	17	14	104	67	54	87	35	55	23
e Ce	49	56	4 4	47	46	4	50	251	50	62	59	84	85	56
PQ	25	28	23	26	23	23	27	146	24	31	36	46	48	31
Pb	9	5	6	5	Ş	9	5	26	9	9	5	5	5	Ş
Тћ	9	7	8	4	7	9	9	14	8	7	5	9	ŝ	4
CIPW calcula	tion													
0	12.7	13.8	11.5	1.76	5.92	4.48	2.26	·	13.5	·	2.35	ı	0.31	·
Ne	•	•	•	•	•	•	•	•	•	•	•	•	•	1
Hy 2	14.4	1.11	11.9	18.44	17.2	19.5	19.5	8.31	13.8	18.1	17.8	16.9	17.5	18.6
5	1		ı	1	ı	ı	1	10.1	•	0.22	•	<i>CK.</i> 0	•	0.41

		Table A(6 (continued).	Major (wt.%)	and trace ele	ment (ppm) co	mposition of	samples from	the western S	ierra Chichina	utzin volcanic	: field.		
Sample	MX28	MX32	MX36	MX38	MX39.2	MX40	MX50	MX51	MX54	MX43	MX44	MX45	MX29	MX30
Locality	Pehualtepec	Emerenciano	Capulhuac	Cuate Mediano	Cuate el Grande	Cuate el Colero	Lama	Lama	Lama	Esperanza	Esperanza	Esperanza	Texontepec	Texontepec
Lat N Long W	19°13'08" 00°14'11"	19°14'49" 00°7'50"	19°11'52"	19°11'42" 00°76'40"	19°11'23"	19°11'47"	19°05'47" 00°27'20"	19°05'31"	19°05'57" 00°22'20"	19°05'12'' 00°76'05''	19°05'35'' 00°76'07''	19°05'59" 00°76'01"	19°14'37"	19°14'42"
Long W Altitude (m)	2850	3040 3040	2710	2770 2770	2730 20	2840	2690 2000	2630 2630	2610 2610	2870 2870	20 02 2880	2820	2910 23 29	2860 2860
Rock type	BA	A	BA	BA	В	В	D	Α	Α	Α	D	D	Α	Α
Affinity	Transitional	$L-TiO_2$	Transitional	Transitional	H-TiO ₂	H-TiO ₂	$L-TiO_2$	$L-TiO_2$	$L-TiO_2$	H-TiO ₂	H-TiO ₂	H-TiO ₂	$L-TiO_2$	$L-TiO_2$
SiO ₂	54.4	59.9	52.0	53.0	50.4	49.9	62.9	59.5	60.09	59.8	65.8	64.7	61.6	61.0
TiO ₂	1.13	0.81	1.37	1.26	1.47	1.52	0.70	0.81	0.85	0.86	0.71	0.75	0.84	0.88
AI_2O_3	16.7	15.4	16.4	16.0	15.7	15.9	16.1	16.7	16.3	16.5	15.7	16.1	16.3	16.2
Fe_2O_3	3.50	2.04	4.24	2.89	5.25	7.04	1.42	1.99	3.39	4.35	1.88	1.66	1.67	1.88
FeO	4.80	4.28	4.04	5.00	4.80	2.88	3.48	4.08	2.72	1.72	2.68	2.96	3.64	3.76
MnO	0.13	0.12	0.14	0.13	0.16	0.16	0.09	0.10	0.11	0.10	0.08	0.09	0.09	0.09
MgO	6.70	5.55	8.08	7.96	7.77	7.91	3.35	4.35	4.33	4.27	1.92	2.19	3.76	3.93
CaO	7.36	6.02	8.62	7.95	8.82	9.13	5.15	6.33	5.56	90.9	4.47	4.76	5.62	5.68
Na ₂ O	3.91	3.77	3.50	3.63	3.57	3.57	4.31	4.17	3.83	4.24	4.30	4.31	4.37	4.31
K20	0.95	1.48	1.15	1.37	1.32	1.25	1.93	1.66 2 11	2.09 2.09	1.56	2.13	1.97	1.73	1.69 2.20
P205	0.15	0.14	0.28	0.27	0.28	0.26	0.13	0.11	0.23	0.16	0.15	0.15 0.15	0.20	0.20
LOI	0.23	0.43	0.14	0.49	0.56	0.47	0.38	0.24	0.58	0.38	0.20	0.31	0.21	0.30
Mg #	63.9	65.5	68.3	68.7	63.1	64.3	59.6	8.09	61.1	61.4	48.8	50.8	60.5	60.2
Λ	145	125	169	153	163	170	90	124	95	116	62	86	94	98
Cr	366	297	345	414	404	434	86	131	135	191	61	58	166	166
Co	34	28	39	36	42	41	16	20	24	21	11	12	17	18
Ņ	177	79	236	243	226	243	38	54	44	98	11	16	89	96
Cu	38	32	24	41	51	48	3	25	13	25	14	13	24	23
Zn	78	<i>LL</i>	89	84	86	81	: 65	71	17	78	76 	75	48 s	87
Kb S	19	40	18 066	47	07	20	41	55	58 24	41 540	706	8C 801	47	47
λ Σ	491 23	000 14	24 24	20 20	27	22	07C	040 13	024 15	040 14	٥ <i>۴</i> د 15	404 13	15 15	610 41
Zr	156	164	162	169	192	176	127	124	135	170	227	201	164	169
Nb	6	7	11	10	11	12	9	4	7	7	8	7	7	7
Ba	238	458	367	467	404	401	416	391	615	492	588	586	641	600
La	12	17	27	29	24	27	17	15	20	19	24	22	25	25
Ce	31	ç, č	2 2	69	65 2	62 92	36	31	53 57	56 20	4/	7.5	65 05	09
PN	<u>9</u> 4	97	<u>65</u> X	' Y	१ ५	3/ 2	<u>81</u> Y	-1 / /	67	0£ 2	47 7	0	32 0	92 0
Th	9 9	0	94		9 9	ov q	94	94	9	9	- 1-	~ ∞	2	9
CIDIT/ and and														
CIPW calcul	anon									07.0				
a Ne	1.14 -	- 10.0				- 0.83	14.1 -	8.39 -		9.48 -		- 18.10		
Hv	21.1	16.8	12.4	15.4	0.43	1	10.4	13.2	14.5	13.1	7.05	7.85	11.5	12.2
0	•		7.00	4.79	16.7	16.6	. 1		. 1	. 1	. 1	. 1	. 1	1

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Sample Locality Lat N Long W Altitude (m) Rock type	MX33 Texontepec 19°13'33" 99°26'42" 2750 A	MX52 Tenango 19°06'65" 99°36'37" 2680 A	MX53 Tenango 19°07'02" 99°36'52" 2640 A	MX85.1 Tenango 19°05'43" 99°36'30" 2760 A	MX85.2 Tenango 19°05'43" 99°36'30" 2760 A	MX86 Tenango 19°05'48" 99°38'48" 2720 A	MX47 Tres Cruces 19°07'53" 99°28'58" 2630 A	MX48 Tres Cruces 19°07'12" 99°31'02" 2610 A	MX49 Tres Cruces 19°06'36" 99°31'31" 2630 A	MX83 Holotepec 19°02'18" 99°29'13" 2670 BA	MX84 Tepexingo 19°01°01° 99°27'25" BA	MX46 Lagunilla 19°04'30" 99°25'52" 2800 A	MX42 Lagunilla 19°04'31" 99°23'56" 2820 A
Affinity	L-1102	L-TiO ₂	L-1102	H-TiO ₂	L-1102	L-TiO ₂	L-1102	$L-TiO_2$	$L-TiO_2$	H-TiO ₂	$L-TIO_2$	$L-TiO_2$	L-TiO ₂
SiO,	61.0	60.9	60.1	59.4	60.8	58.6	60.4	59.4	60.7	54.3	56.0	60.0	60.6
TiO ₂	0.79	0.75	0.79	1.04	0.77	0.82	0.78	0.84	0.86	1.26	0.92	0.84	0.90
$\mathbf{Al}_2\mathbf{O}_3$	16.6	16.6	16.5	16.7	16.4	16.8	16.6	16.2	16.3	16.8	17.2	16.8	16.1
Fe_2O_3	1.27	1.80	2.23	2.03	2.36	2.16	1.98	2.14	2.09	2.53	2.56	1.85	2.13
FeO	4.04	3.84	3.64	4.28	3.32	4.08	3.80	3.96	3.64	5.48	4.72	3.92	3.72
MnO	0.10	0.10	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.14	0.12	0.10	0.10
MgO	4.39	3.98	4.34	4.03	4.09	4.31	4.13	4.89	3.66	6.32	5.58	4.16	3.93
CaO	5.47	5.99	6.13	6.01	6.05	6.48	6.09	6.23	5.83	7.44	7.08	6.18	6.07
Na_2O	4.38	3.91	3.90	4.24	3.84	3.86	3.91	4.04	4.26	3.97	3.90	4.10	4.11
K_2O	1.50	1.80	1.79	1.67	1.77	1.70	1.75	1.67	1.79	1.30	1.35	1.64	1.67
P_2O_5	0.13	0.12	0.15	0.20	0.14	0.15	0.13	0.17	0.17	0.20	0.16	0.17	0.19
LOI	0.30	0.21	0.35	0.29	0.34	0.86	0.34	0.41	0.57	0.26	0.32	0.27	0.44
Mg#	64.0	60.4	61.7	58.0	61.2	0.09	60.8	63.5	58.2	63.1	63.0	61.0	59.4
Λ	107	113	117	106	114	129	115	116	110	139	124	110	103
Cr	213	67	76	150	104	120	105	220	136	302	255	200	167
Co	21	18	21	20	19	22	20	22	20	32	27	22	19
Ni	103	42	52	79	43	39	45	100	64	149	118	82	74
Cu	22	6	16	27	17	18	16	27	30	34	34	28	26
Zn	76	68	71	80	69	72	68	77	81	81	81	78	62
Rb	38	37	36	40	38	38	36	44	45	25	30	43	46
Sr	467	645	647	551	654	667	663	561	592	549	589	586	619
Y	13	11	11	16	12	12	12	17	19	23	21	14	16
Zr	146	126	129	189	128	130	129	154	180	171	161	176	184
Nb	7	9	9	11	9	9	9	9	7	13	9	8	7
Ba	391	412	414	479	415	392	400	558	524	337	451	534	577
La	16	11	14	20	17	11	17	17	26	23	24	24	24
Ce	39	33	36	43	38	370	36	54	58	35	37	55	58
Nd	17	16	19	23	19	17	21	27	32	19	19	27	33
Pb	5	9	5	10	7	\$	\$	5	5	\$	\$	9	9
Th	4	5	9	8	7	Э	4	4	5	4	4	9	9
CIPW calcular	tion												
0 N	10.8	11.8	10.5	9.0	12.1	8.81	1.11	8.68	10.9	0.27	3.61	10.0	11.4
Hv	14.0	12.8	13.5	- 13.0	- 12.9	13.8	13.1	- 14.5	- 11.4	- 19.2	- 18.1	- 13.0	- 11
0	1				1		1						

Table A6 (continued). Major (wt.%) and trace	element (ppm) composition of samples fr	om the western Sierra Chichinautzin volcanic field.

Sample	MX14	d-54	ТЕВ	Sc02	Sc05	Sc08	Sc09	d-10	d-50	d-51
Locality	Cuautl	Tenango	Tenango	Tenango	Tenango	Tenango	Tenango	Sta. Cruz	Villa	Villa
									Metepec	Metepec
Lat N	19°09'46"	19°06'58.0"	19°06'41.9"	19°05'40.9"	19°06'17.5"	19°06'54.7"	19°06'41.9''	19°10'18"	19°14'57.1"	19°14'51.4"
Long W	99°25'45"	99°36'40.3''	99°37'49.4"	99°36'28.4"	99°38'28.2"	99°36'50.3"	99°37'49.4''	99°29'44"	99°36'11.1"	99°36'14.3"
Altitude (m)	2850	2660	2640	2650	2620	2675	1650	2612	2592	2660
Affinity	H-TiO ₂	L-TiO ₂	H-K ₂ O	L-TiO ₂	L-TiO ₂					
Rock type	BA	Α	А	А	А	А	А	BTA	BA	Α
SiO ₂	55.01	60.6	61.0	60.2	60.0	60.6	61.0	55.1	56.1	56.9
TiO ₂	1.29	0.70	0.68	0.71	0.72	0.70	0.68	1.00	1.01	1.00
Al_2O_3	16.4	16.1	16.2	16.1	16.2	16.1	16.2	13.9	15.7	15.8
FeO _{Tot}	7.48	4.94	4.93	5.12	5.24	4.94	4.93	6.87	6.43	6.19
MnO	0.13	0.09	0.09	0.09	0.09	0.09	0.09	0.12	0.11	0.10
MgO CaO	0.09	4.49	4.33	4.//	4.91	4.49	4.55	0.20	6.78	6.55
Na.O	/.10	3.93	3.04	3.03	3.89	3.93	3.40	9.29 3.37	0.78 3.75	3.80
K ₁ O	1.23	1.75	2.01	1.69	1.69	1.75	2.01	3.15	1 45	1.51
P ₂ O ₅	0.26	0.17	0.18	0.17	0.17	0.17	0.18	0.86	0.25	0.24
LOI	0.54	0.72	0.77	0.60	0.60	0.72	0.77	0.54	0.37	0.14
Mg #	63.1	68.0	67.2	66.2	66.3	65.6	64.8	61.9	69.9	69.3
Sc	-	-	-	-	-	-	-	16	20	20
V	139	114	111	118	120	114	111	147	124	122
Cr	255	118	116	148	149	118	116	171	359	375
Со	28.9	18.1	18.3	20.7	20.5	18.1	18.3	21.2	31.8	30.3
Ni	79	50	46	48	51	50	46	103	164	151
Cu	30	15	15	16	17	15	15	40	36	33
Zn	86	64	66	67	66	64	66	92	69 16	65 16
Ga Rh	24	36	31	30	31	34	31	50	32	32
Sr	634	630	628	619	620	630	628	1830	530	542
Y	25	15	15	17	16	15	15	37	21	22
Zr	178	121	127	122	119	121	127	279	167	146
Nb	13	-	-	-	-	-	-	8.8	5.6	5.6
Cs	-	1.3	1.3	1.4	1.3	1.3	1.3	1.7	1.3	1.3
Ba	418	413	413	404	404	413	413	2951	394	400
La	24.2	13.6	14.1	14.5	14.0	13.6	14.1	113	19	18
Ce	55	29	30	32	30	29	30	229	41	40
Pr Nd	8.2	-	-	-	-	-	-	31.2 125	5.6	5.4 22
Sm	5.41	3 41	3.5	3 71	3.62	3 41	3.5	26.5	23 5 2	23 5 1
En	2 42	1.04	1.06	1.07	1.13	1 04	1.06	6 40	1.56	1.52
Gd	5.0	-	-	-	-	-	-	17.4	4.59	4.35
Tb	0.9	0.5	0.5	0.5	0.5	0.5	0.5	2.0	0.69	0.67
Dy	4.27	-	-	-	-	-	-	8.50	3.91	3.78
Ho	0.81	-	-	-	-	-	-	1.24	0.75	0.73
Er	1.89	-	-	-	-	-	-	3.06	2.12	2.07
Tm	0.42	-	-	-	-	-	-	0.39	0.31	0.30
Yb	2.04	1.46	1.51	1.60	1.59	1.46	1.51	2.35	1.99	1.91
LU TIE	0.49	0.21	0.24	0.25	0.27	0.21	0.24	0.33	0.28	0.28
III Ta	0.9	0.3	0.3	0.3	0.3	0.3	0.3	0.5	4.08	4.19
Ph	6	<5	6	3	7	3	6	23	<5	<5
Th	4.6	2.7	2.8	3.0	2.8	2.7	2.8	14.7	2.9	2.9
U	1.5	1.1	0.9	0.9	1.1	1.1	0.9	4.2	1.2	1.1
CIPW calcular	tion									
Q	1.70	11.8	11.3	10.6	10.2	11.8	11.3	0.83	3.55	4.51
Ne	-	-	-	-	-	-	-	-	-	-
Hy	18.4	13.4	12.9	9.79	10.1	9.35	8.88	9.40	15.0	10.1
01	-	-	-	-	-	-	-	-	-	-

Sample	d-56	d-42	d-47	d-53	d-45	d-37	d-25	XTN	L2
Locality	Villa	Texontepec	Texontepec	Cuate	Capulhuac	Tezoyuca	Pelagatos	Tenango	Lama
	Metepec	(proximal)	(distal)	Grande					
Lat N	19°06'44.9"	19°14'22.6"	19°15'00.3"	19°11'27.2"	19°11'50.0"	18°48'40"	19°06'00"	19°05'22.4"	19°07'00.3"
Long W	99°25'35.1"	99°24'43.5"	99°27'36.3"	99°26'18.0"	99°27'26.4"	99°12'36"	99°50'00"	99°37'35.3"	99°33'15.6"
Altitude (m)	2732	2846	2587	2742	2686	1225	1243	3087	2622
Affinity	L-TiO	L-TiO	L-TiO	Trans	Trans	H-TiO	L-TiO		
Rock type				BA	B	R R	RA RA		
Rock type		11		DIT	Б	D	D <i>T</i>		
SiO ₂	59.6	61.6	61.9	52.4	51.3	51.6	54.0	49.1	58.3
	0.88	0.80	0.73	1.25	1.34	1.61	0.81	1.38	0.97
	16.7	15.7	15.8	15.3	15.5	15.6	15.42	13.7	18.8
FeO _{Tot}	5.21	4.97	4.82	7.34	/.40	8.4/	6.91	/.01	5.79
MnO M-O	0.09	0.09	0.08	0.12	0.12	0.14	0.12	0.13	0.09
MgU	4.32	4.30	4.54	8.51	8.39	8.24	9.24	9.93	2.49
	5.40	5.44	5.12	8.12	8.38	7.93	7.51	14.5	5.92
K O	4.19	4.51	4.33	5.39	5.57	5.45 1.20	3.33 0.06	2.01	4.47
R ₂ O	0.21	0.26	0.18	0.37	0.31	0.46	0.90	0.21	0.20
	1.06	-0.05	0.18	0.19	0.32	0.40	0.15	0.24	0.18
	(2.5	6.05	6.15	70.0	70.0	(7.1	72.7	74.0	47.4
Mg #	63.5	64.47	66.4	/0.9	/0.9	67.1	/3./	/4.8	47.4
Sc	14	12	13	22	23	26	23	20	14
V	90	90	93	159	148	169	154	101	98
Cr	198	241	253	377	379	374	514	219	43
Со	21.8	18.7	19.5	39.3	41.4	38	41	31	15
Ni	97	117	120	220	229	184	255	91	30
Cu	28	41	27	46	44	36	46	42	11
Zn	73	82	72	67	63	74	67	61	68
Ga	19	17	19	17	17	15	18	16	21
Rb	25	31	34	26	16	19	20	2	26
Sr V	527	598	457	823	808	490	402	612	/04
Y 7	18	18	17	26	25	30	18	22	15
ZI	138	144	144	101	1/4	12.0	26	140	139
Cs	1.06	4.9	5.2 1.4	0.7	9.4	0.7	1.0	12.2 bdl	0.8
Ra	409	612	438	440	423	359	243	276	354
La	17	22	16	27	25	20	11	19	13
Ce	35	46	34	62	56	42	25	41	30
Pr	4.7	6.6	4.5	8.6	7.5	5.6	3.5	5.5	3.8
Nd	20	27	19	37	33	24	15	23	16
Sm	4.4	5.8	4.3	7.9	6.8	5.4	3.6	5.4	4.1
Eu	1.41	1.68	1.29	2.33	2.07	1.78	1.16	1.66	1.38
Gd	3.97	4.68	3.76	6.72	5.90	5.20	3.51	5.02	3.84
Tb	0.60	0.63	0.58	0.99	0.89	0.81	0.55	0.80	0.62
Dy	3.28	3.18	3.08	5.00	4.64	4.78	3.30	4.37	3.45
Но	0.62	0.56	0.58	0.91	0.89	0.93	0.64	0.83	0.64
Er	1.81	1.51	1.66	2.64	2.59	2.64	1.85	2.39	1.86
Tm	0.27	0.21	0.24	0.38	0.38	0.38	0.27	0.34	0.28
Yb	1.67	1.29	1.51	2.38	2.34	2.37	1.71	2.11	1.79
Lu	0.24	0.18	0.22	0.33	0.32	0.34	0.25	0.31	0.27
Hf T	4.31	3.90	4.20	4.74	4.57	4.18	3.07	3.99	4.33
Ta	0.6	0.4	0.4	0.6	0.6	1.1	0.2	0.8	0.4
PD Th	6	6	<5	<5	<5	<>>	<5	<5	/ 2 5
10	2.7	5.5	5.0	3.2	2.9	2.2	1.9	2.4	5.5
U	1.1	1.4	1.5	1.2	0.9	0.8	U./	0.9	1./

Table A6 (continued). Major (wt.%) and trace element (ppm) composition of samples from the western Sierra Chichinautzin volcanic field.

Trans.: Transitional; Mg#: $100 \times Mg / [Mg^{2+} + Fe^{2+}]$ with Fe= $0.85 \times FeO_{tot}$ (Frey *et al.*, 1978). A: and esite, B: basalt, BA: basaltic and esite, BTA: basaltic trachy-andesite, D: dacite. bdl: below detection limit. CIPW calculated by using SINCLAS software of Verma *et al.* (2002).

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-

9.52

0.8

-

-

12.1

5.10

0.7

0.63

19.8

-

1.7

0.9

-

-

10.2

6.50

1.3

12.4

9.90

-

1.4

11.9

8.90

-

10.7

10.1

CIPW calculation

Q

Ne

Hy

0l