G-probe 22 Summary Report
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Stephen Wilson

A total of thirty one labs submitted final results during this stage of the G-probe 22 study. Technique breakdown was, twenty three labs used LA-ICP-MS, four used SEM, and eight used EPMA. Four labs reported results using multiple techniques or provided multiple datasets. In a departure from previous G-probe studies the median concentration value determined in the study was used as the target value.

Starting material for this test sample was derived from an archived glass sample prepared in 1976 at the Corning Glass Works for the USGS. The starting material (GSC) was used as a six-step emission spectroscopy calibration material (Myers A.T., et al, 1976, USGS professional paper 1013). The glass was converted to a basalt matrix (BCR-2) through the addition of specific reagent grade compounds (Fe_2O_3, Al_2O_3, MgO, CaO, TiO2). Conversion of glass was accomplished at the USGS by melting 600 g in a one liter platinum bowl at 1325° C over a period of six hours. At the end of the melting period the molten material was poured into a platinum boat and rapidly lowered into a water bath for quenching. Twenty grams of random fragments were selected, ground and then split into representative aliquots for bulk analysis testing. Samples were analyzed for their total element content using techniques at the USGS and Agat Laboratories, Canada.

Below you will find summary results for each element studied in this test. In the element diagrams you will find information for each technique providing a value. Also included is the target value (♦) and calculated precision (X ± Ha) (♦) based on the Horowitz equation. A figure is also presented representing the data compilation for the entire study when more than one technique reported values. The study median is represented by ■ , the standard deviation of the median by ▪ and the maximum and minimum values by □. This study median is calculated primarily for the analysis of the major elements where multiple techniques provided data. For each technique an average value is presented (ex. LA-ICP-MS, ▲) as well as ± one standard deviation (ex. LA-ICP-MS, ▲), and the maximum and minimum values reported (ex. LA-ICP-MS, Δ).

Table 1. Symbols used on figures 1 through 53

Symbol type		Represents
Large solid symbol,	●	Study or method average
Small solid symbol,	•	Study or method one standard deviation
Large open symbol,	○	Study or method Maximum or Minimum

Myers A.T., Havens R.G., Connor J.J., Conklin N.M., Rose H.J. Jr., Glass Reference Standards for the Trace-Element Analysis of Geologic Materials-Compilation of Interlaboratory Data,1976 Geological Professional Paper 1013.

Table 2. Summary results for GP-22, GSC-2G

Oxide	Xa %m/m	Ha %m/m	s.d.m. %m/m	GP-22 median	MAX %m/m	Min %m/m
SiO2	55.95	1.22	0.87	55.95	58.64	53.62
TiO2	0.82	0.03	0.07	0.82	0.94	0.50
Al2O3	13.41	0.36	0.40	13.41	14.44	12.74
Fe2O3	13.53	0.37	0.38	13.53	13.86	12.38
FeO	12.17	0.33	0.23	12.17	12.69	11.75
MnO	0.04	0.00	0.00	0.04	0.05	0.03
MgO	3.46	0.11	0.20	3.46	4.17	3.05
CaO	6.51	0.20	0.12	6.51	6.79	6.16
Na2O	3.81	0.12	0.19	3.81	4.31	3.54
K2O	2.53	0.09	0.13	2.53	3.01	2.22
P2O5	0.20	0.01	0.06	0.20	0.39	0.07

Element	Xa mg/kg	Ha mg/kg	s.d.m. mg/kg	GP-22 median	MAX mg/kg	Min mg/kg
Ag	4.7	0.6	0.6	4.7	6.1	3.6
As	3.6	0.5	5.6	3.6	25.9	2.4
Au	1.0	0.2	1.6	1.0	6.5	0.6
B	9.2	1.1	2.7	9.2	17.0	6.7
Ba	6.0	0.7	0.4	6.0	7.1	4.8
Be	4.8	0.6	0.7	4.8	6.2	2.5
Bi	2.5	0.4	0.4	2.5	3.2	1.5
Br	-	-	-	-	-	-
Cd	1.9	0.3	0.5	1.9	3.1	1.1
Ce	4.8	0.6	0.3	4.8	5.3	3.7
Cl	-	-	-	-	-	-
Co	4.4	0.6	0.2	4.4	4.9	3.6
Cr	10.3	1.2	1.0	10.3	13.4	8.5
Cs	3.5	0.5	0.2	3.5	3.8	2.9
Cu	6.2	0.8	0.8	6.2	9.3	5.1
Dy	4.6	0.6	0.3	4.6	5.2	3.7
Er	4.5	0.6	0.4	4.5	5.2	3.5
Eu	4.4	0.6	0.3	4.4	5.3	3.5
F	-	-	-	-	-	-
Ga	18.1	1.9	1.3	18.1	20.3	14.5
Gd	4.6	0.6	0.4	4.6	5.7	3.5
Ge	4.3	0.5	1.2	4.3	8.2	3.5
Hf	4.6	0.6	0.3	4.6	5.3	3.7
Hg	#NUM!	-	#DIV/0!	#NUM!	0.0	0.0
Ho	4.6	0.6	0.3	4.6	5.5	3.7
I	-	-	-	-	-	-

Element	Xa mg/kg	Ha mg/kg	s.d.m. mg/kg	GP-22 median	MAX mg/kg	Min mg/kg
In	3.5	0.5	0.3	3.5	4.6	3.0
Ir	0.4	0.1	0.7	0.4	1.9	0.1
La	4.4	0.6	0.3	4.4	4.9	3.4
Li	9.8	1.1	0.8	9.8	11.1	6.5
Lu	4.9	0.6	0.4	4.9	6.1	3.9
Mn	336.5	22.4	19.6	336.5	358.4	271.1
Mo	4.6	0.6	0.4	4.6	5.9	3.8
Nb	5.8	0.7	0.5	5.8	6.8	4.7
Nd	4.8	0.6	0.4	4.8	5.9	3.7
Ni	11.4	1.3	0.7	11.4	12.9	9.5
Os	-	-	-	-	-	-
Pb	5.0	0.6	0.4	5.0	6.0	4.0
Pd	2.9	0.4	2.0	2.9	7.2	2.5
Pr	4.4	0.6	0.2	4.4	5.2	4.0
Pt	0.8	0.1	0.5	0.8	1.9	0.1
Rb	4.9	0.6	8.1	4.9	54.5	4.1
Re	-	-	-	-	-	-
Rh	-	-	-	-	-	-
Ru	-	-	-	-	-	-
S	-	-	-	-	-	-
Sb	4.2	0.5	0.5	4.2	5.1	2.9
Sc	5.3	0.7	2.5	5.3	18.4	3.9
Se	0.7	0.1	0.3	0.7	1.0	0.2
Sm	4.6	0.6	0.3	4.6	5.3	3.7
Sn	4.4	0.6	1.3	4.4	8.4	3.6
Sr	27.5	2.7	8.3	27.5	67.3	21.9
Ta	4.5	0.6	0.5	4.5	5.4	3.4
Tb	4.4	0.6	0.4	4.4	5.5	3.6
Te	-	0.4	-	255.6	-	-
Th	4.6	0.6	0.4	4.6	5.6	3.7
Tl	0.1	0.0	0.1	0.1	0.6	0.1
Tm	4.4	0.6	0.3	4.4	5.4	3.6
U	4.8	0.6	0.3	4.8	5.2	3.9
V	5.4	0.7	0.3	5.4	5.8	4.4
W	4.5	0.6	0.3	4.5	5.0	3.7
Y	5.3	0.7	0.6	5.3	7.6	4.2
Yb	4.8	0.6	0.4	4.8	5.9	4.0
Zn	10.7	1.2	1.1	10.7	13.0	8.3
Zr	11.2	1.2	2.0	11.2	21.6	8.7

Xa = Target value - GP-20 compiled median results
Ha = Target precision calculated using modified version of Horowitz equation for data quality 2 ($Ha = 0.01Xa^{0.8495}$)
s.d.m. = Standard deviation of population mean
GP-21 med. = Median element concentration for all techniques reporting
Max. = Maximum element/oxide concentration reported
Min. = Minimum element/oxide concentration reported

Table 3 G-probe 22 contributed data for GSC-2G

	GP-22 LA-ICPMS	GP-22 LA-ICPMS	GP-22 LA-ICP-MS	GP-22 LA-ICP-MS	GP-22 LA-ICP-MS	GP-22 LA-ICP-MS	GP-22 LA-ICP-ns	GP-22 LA-ICP-fs	GP-22 LA-ICP-MS	GP-22 La-ICP-MS
Data quality	2	2	2	2	2	2	2	2	2	2
LAB ID	1	1	2	2	3	3	4	4	5	5
Oxide/element										
SiO2, %	55.95	55.83			56.49	56.35				
TiO2	0.82	0.82			0.84	0.82			0.83	0.82
Al2O3	12.99	13.03			13.61	13.67			14.44	14.08
Fe2O3T	13.69	13.65			13.53	13.67				
Fe(II)O					12.17	12.30				
MnO					0.04	0.04			0.04	0.04
MgO	3.46	3.45			3.42	3.41			3.30	3.25
CaO	6.53	6.59			6.79	6.75			6.57	6.41
Na2O	3.75	3.73			3.89	3.89			3.72	3.72
K2O	2.43	2.45			2.49	2.51			2.51	2.51
P2O5	0.33	0.39	0.0711	0.077	0.21	0.21			0.18	0.17
Ag, mg/kg	5.21	4.67	3.77	3.59	4.08	4.38			4.58	4.43
As	2.74	2.63	3.32	3.2					25.89	23.58
Au	1.73	0.86	0.9	0.89			1.02	1.02	0.99	
B	9.32	7.79	6.95	6.78	10.09	9.21	8.12	8.05		
Ba	6.60	6.35	4.82	4.84	6.26	6.18	6.03	6	6.32	6.20
Be	4.60	5.44	3.7	3.56	5.87	6.20	4.58	4.66	4.84	4.78
Bi	2.53	2.49	1.93	1.91	2.25	2.20	2.46	2.4	2.64	2.59
Br										
Cd	1.22	1.13	1.65	1.62	1.87	1.66	2.22	2.19	2.20	2.02
Ce	5.03	4.72	3.75	3.73	4.87	4.87	4.97	4.9	4.70	4.59
Cl										
Co	4.41	4.51	3.59	3.62	4.14	4.13	4.75	4.66	4.29	4.31
Cr	10.05	10.55	8.52	8.47	11.05	10.05	9.8	9.66	9.93	9.96
Cs	3.65	3.52	2.92	2.86	3.39	3.40	3.59	3.52	3.30	3.31
Cu	6.91	6.07	5.2	5.08	5.95	5.60	5.93	5.75	6.12	5.95
Dy	4.82	4.87	3.69	3.68	4.96	4.86	4.51	4.46	4.72	4.52
Er	4.57	4.45	3.58	3.51	4.72	4.75	4.28	4.24	4.50	4.33
Eu	4.62	4.43	3.45	3.47	4.35	4.37	4.46	4.44	4.45	4.30
F										
Ga	17.17	16.65	15.12	14.87	19.23	19.09	17.8	17.5	17.55	17.33
Gd	4.64	4.55	3.6	3.54	4.58	4.58	4.38	4.33	4.69	4.47
Ge	3.99	4.07	3.87	3.76			4.46	4.43	5.04	5.01
Hf	4.82	4.67	3.79	3.74	4.79	4.83	4.6	4.52	4.83	4.61
Hg										
Ho	4.67	4.66	3.72	3.71	4.82	4.78	4.71	4.65	4.63	4.44
I										
In	3.49	3.52	3.27	3.25			3.93	3.85	3.55	3.54
Ir	1.90	1.88	0.09	0.08			0.16	0.15		
La	4.60	4.44	3.44	3.39	4.40	4.46	4.62	4.57	4.39	4.29
Li	10.44	9.93	8.19	8.06	9.62	9.59	9.41	9.34	9.29	9.33
Lu	4.94	4.88	3.97	3.94	5.03	5.02	5.1	5.01	4.91	4.64
Mn	352.10	348.24	275.5	271.1			305	307	331.98	327.62
Mo	4.70	4.76	3.8	3.75	4.83	4.81	4.44	4.34	4.46	4.48
Nb	6.01	5.97	4.67	4.65	6.26	6.27	6.04	5.99	5.97	5.90
Nd	4.95	4.87	3.77	3.7	4.82	4.86	4.77	4.74	4.82	4.74
Ni	12.86	11.34	9.54	9.59	10.84	10.56	12.2	12.2	11.56	11.35
Os										
Pb	5.30	5.12	4.08	4.03	5.54	5.39	5.04	4.99	4.96	4.90
Pd			2.76	3			2.94	2.92		
Pr	4.62	4.38			4.59	4.56	4.82	4.8	4.50	4.35
Pt	1.79	1.91	0.72	0.71			0.81	0.79		
Rb	5.08	4.91	4.15	4.08	4.92	4.98	4.92	4.81	4.87	4.89
Re	1.00	1.05	0.82	0.8			0.95	0.95		
Rh			0.21	0.21			0.24	0.24		
Ru										
S									565.07	562.54
Sb	4.86	5.06	3.37	3.37	3.47	3.42	4.02	3.91	3.69	3.75
Sc	10.07	8.91	3.93	3.86	5.33	5.23	6.43	6.47	7.44	7.17
Se	0.37	0.24	0.68	0.7						
Sm	4.77	4.44	3.66	3.68	4.81	4.84	4.6	4.57	4.75	4.56
Sn	3.58	3.65	3.75	3.71	4.73	4.75	4.45	4.4	5.01	4.86
Sr	28.64	28.19	22.1	21.9	28.15	28.38	28.6	28.6	27.06	26.49
Ta	4.31	4.22	3.59	3.54	5.11	5.07	4.73	4.7	4.61	4.44
Tb	4.57	4.39	3.59	3.56	4.75	4.71	4.66	4.61	4.46	4.32
Te										
Th	4.54	4.63	3.75	3.74	4.75	4.66	4.82	4.81	4.78	4.61
Tl	0.12	0.09	0.08	0.07	0.11	0.10	0.09	0.09	0.08	0.09
Tm	4.47	4.47	3.61	3.62	4.82	4.74	4.52	4.44	4.49	4.32
U	4.96	4.92	3.89	3.87	5.24	5.14	4.87	4.86	4.82	4.84
V	5.71	5.55	4.43	4.43	5.37	5.41	5.33	5.26	5.29	5.24
W	4.85	4.76	3.72	3.71	4.36	4.34	4.31	4.26		
Y	5.53	5.38	4.2	4.2	5.48	5.49	5.19	5.11	5.24	5.03
Yb	4.98	5.08	3.98	3.96	5.17	5.13	4.81	4.73	4.91	4.71
Zn	12.11	11.86	9.5	9.48	10.65	9.43	12.1	11.8	11.57	11.33
Zr	12.74	11.93	8.69	8.75	11.39	11.16	10.8	10.6	11.39	10.88

Table 3 cont.

Data quality	GP-22 LA-ICP-MS 2	GP-22 La-ICP-MS 2	GP-22 LA-ICP-MS 2	GP-22 La-ICP-MS 2	GP-22 LA-ICP-MS 2	GP-22 LA-ICP-MS 2	GP-22 LA-ICP-MS 2	GP-22 LA-ICP-MS 2	GP-22 LAICPMS 2	GP-22 LAICPMS 2
LAB ID	6	6	7	7	8	8	9	9	10	10
Oxide/element										
SiO2, %			55.76		55.94	55.97			55.02	55.24
TiO2			0.71		0.81	0.82	0.507	0.503	0.77	0.78
Al2O3			13.61		13.66	13.66			12.86	12.91
Fe2O3T			12.91						13.81	13.86
Fe(II)O			12.02		12.32	12.28				
MnO			0.04		0.05	0.05			0.04	0.04
MgO			3.29		3.41	3.41			3.43	3.45
CaO			6.16		6.64	6.66			6.50	6.50
Na2O			3.84		4.03	4.01			3.70	3.71
K2O			2.79		2.54	2.55			2.42	2.40
P2O5			0.16		0.23	0.22			0.17	0.17
Ag, mg/kg			4.46		3.97	4.01	5.71	5.42	4.70	4.99
As			3.93				6.46	6.2	2.90	2.82
Au			2.25				6.45	6.3	0.98	0.86
B			9.26				15.3	15.4	10.30	11.01
Ba	6.54	7.10	5.35		6.11	6.05	5.94	5.93	5.76	5.78
Be	4.64	5.18	3.85		4.91	4.86	4.3	4.25	5.22	5.33
Bi			2.4				2.52	2.49	2.66	2.62
Br										
Cd			1.72				3.06	3.1	1.52	1.18
Ce	4.96	5.28	4.4		4.87	4.85	4.63	4.64	4.78	4.77
Cl			661.5				185	230		
Co	4.61	4.90	4.2		4.19	4.25	4.42	4.37	4.30	4.38
Cr	10.16	10.47	9.44		10.49	10.66	12.7	13.4	9.82	10.47
Cs	3.45	3.61	3.51		3.24	3.25	3.54	3.53	3.45	3.39
Cu	6.18	6.60	5.61		6.23	6.32	5.07	5.11	6.52	6.51
Dy	4.66	5.19	4.04		4.90	4.85	4.37	4.32	4.60	4.58
Er	4.72	4.94	3.8		4.77	4.82	4.31	4.2	4.50	4.55
Eu	4.61	5.28	4.13		4.45	4.45	4.18	4.2	4.35	4.27
F										
Ga	16.76	19.23	18.4		18.49	18.23	18.3	18.11	17.76	17.69
Gd	4.86	5.04	3.87		4.80	4.84	4.36	4.32	4.69	4.66
Ge			4.93				4.47	4.45	3.53	3.84
Hf	4.74	5.22	4.16		4.85	4.95	4.5	4.43		
Hg										
Ho	4.61	5.50	4.15		4.91	4.91	4.49	4.43	4.61	4.54
I										
In			3.78				3.86	3.86	3.35	3.35
Ir									0.52	0.48
La	4.80	4.93	4.23		4.45	4.43	4.29	4.25	4.39	4.27
Li	10.04	11.03	10.21		9.47	9.55	10.2	10.17	9.71	10.01
Lu	4.93	5.02	4.38		5.08	5.10	4.75	4.69	4.89	4.78
Mn	340.95	358.03	320.8				338	335	339.38	340.08
Mo			4.1		4.70	4.74	5.93	5.78	4.51	4.69
Nb	6.73	5.86	5		6.29	6.25	5.74	5.73	5.67	5.64
Nd	4.99	5.34	4.34		5.08	5.12	4.67	4.64	4.81	4.76
Ni	11.39	10.40	11.14		11.51	11.25	11.66	11.46	11.44	11.09
Os										
Pb	5.20	5.52	4.76		5.01	5.03	5.98	5.97	5.02	5.04
Pd							7	7.22		
Pr	5.16	4.74	3.98		4.74	4.75	4.43	4.41	4.43	4.34
Pt							0.127	0.124	0.87	0.85
Rb	5.12	5.14	5.24		4.97	5.00	4.97	5	4.81	4.70
Re			2.12				1.52	1.55	1.01	1.01
Rh							1.27	1.27		
Ru										
S							199	210		
Sb			3.71				4.12	4.09	4.36	4.34
Sc			4.36		6.55	6.56	4.71	4.64	4.82	4.75
Se									0.66	0.99
Sm	4.81	5.27	4.26		4.77	4.69	4.47	4.45	4.60	4.52
Sn			8.17				4.08	3.99	3.94	3.77
Sr	29.54	32.20	25.05		28.23	28.15	27.3	27.3	27.18	27.08
Ta	5.02	5.28	3.42		5.37	5.30	4.38	4.33		
Tb	4.89	5.47	4.02		4.84	4.85	4.32	4.29	4.44	4.34
Te										
Th	4.96	5.43	4.09		4.85	4.83	4.55	4.49	4.53	4.52
Tl			0.16		0.08	0.09	0.64	0.63	0.15	0.13
Tm	4.69	5.44	3.91		4.66	4.65	4.34	4.29	4.43	4.37
U	5.06	5.06	4.57		4.68	4.72	4.68	4.69	4.83	4.79
V	5.40	5.63	5.23		5.34	5.40	5.41	5.38	5.60	5.42
W			4.45		4.26	4.36	4.91	4.88		
Y	5.67	5.67	4.75		5.66	5.75	5.1	5.03	5.32	5.35
Yb	4.99	5.23	4.5		5.17	5.16	4.72	4.69	4.84	4.81
Zn	11.39	10.82	9.78		8.96	9.10	10.74	10.9	10.84	10.33
Zr	11.94	11.32	9.99		11.74	11.87	10.59	10.49	11.15	11.09

Table 3 cont.

	GP-22	GP-22	GP-22	GP-22	GP-22	GP-22	GP-22	GP-22	GP-22	GP-22
	LA-ICP-MS	LA-ICP-MS	LA-ICPMS	LA-ICPMS	LA-ICPMS	LA-ICPMS	LAICPMS	LAICPMS	LA-ICP-MS	LA-ICP-MS
Data quality	2	2	2	2	2	2	2	2	2	2
LAB ID	11	11	12	12	13	13	14	14	15	15
Oxide/element										
SiO2, %	56.52	56.56					57.16	55.99	56.43	56.11
TiO2	0.86	0.94					0.79	0.79	0.81	0.82
Al2O3	14.08	13.59					13.55	13.47	12.88	12.93
Fe2O3T							13.54	13.3	13.53	13.69
Fe(II)O	12.69	12.37								
MnO	0.05	0.04							0.04	0.05
MgO	3.79	3.56					3.56	3.52	3.42	3.45
CaO	6.50	6.76							6.29	6.38
Na2O	4.27	4.17					3.99	3.87	3.92	3.89
K2O	2.47	2.58					2.52	2.48	2.42	2.43
P2O5	n.a.	n.a.					0.21	0.2	0.22	0.22
Ag, mg/kg	5.90	6.15	4.99	4.78			4.68	4.35	5.22	4.75
As	3.68	3.99	3.42	3.34			3.36	3.44	3.88	3.97
Au	1.01	1.23	0.72	0.64					1.57	1.05
B	7.88	8.68	6.92	6.70			13.48	11.17		
Ba	6.14	6.54	6.03	5.90	5.94	5.96	6.02	5.93	6.21	6.26
Be	2.50	2.61	5.05	4.79	4.76	4.87	4.98	4.65	4.82	4.77
Bi	2.90	3.18	2.95	2.88					2.76	2.73
Br										
Cd	2.70	2.66	2.09	1.87			1.57	1.67	2.13	2.13
Ce	5.12	4.89	4.81	4.76	4.84	4.70	4.82	4.81	4.56	4.56
Cl										
Co	4.26	4.49	4.41	4.40	4.57	4.36	4.4	4.35	4.44	4.43
Cr	12.14	11.77	10.43	10.28	10.01	9.88	10.27	10.67	10.27	10.39
Cs	3.33	3.48	3.58	3.50	3.59	3.51	3.48	3.42	3.79	3.80
Cu	7.16	7.36	7.31	7.18	6.59	6.14	9.25	8.62	6.33	6.12
Dy	4.58	4.94	4.70	4.66	4.46	4.25	4.72	4.72	4.57	4.74
Er	4.45	4.36	4.52	4.49	4.22	4.28	4.53	4.57	4.36	4.47
Eu	4.60	4.32	4.45	4.42	4.38	4.25	4.43	4.42	4.28	4.41
F										
Ga	19.26	18.58	18.02	17.86	16.46	15.87	18.1	17.51	19.18	19.63
Gd	4.60	4.39	4.72	4.67	4.46	4.78	4.61	4.65	4.42	4.57
Ge	3.85	3.92	8.16	8.06			4.23	4.35	4.75	4.78
Hf	4.58	4.38	4.64	4.57	4.49	4.48	4.69	4.7	4.53	4.67
Hg										
Ho	4.56	4.33	4.64	4.57	4.14	4.25	4.64	4.69	4.47	4.60
I										
In	4.45	4.60					3.57	3.43	3.78	3.79
Ir	0.26	0.25	1.07	1.13						
La	4.51	4.57	4.41	4.36	4.27	4.27	4.37	4.42	4.28	4.35
Li	9.74	9.92	10.23	9.93	9.00	8.90	10.18	9.91	10.04	9.93
Lu	4.89	4.75	4.94	4.89	4.47	4.59	4.92	4.98	4.85	5.00
Mn	358.39	348.52	350.97	349.22	310.96	303.76	338	335	340.32	348.89
Mo	4.82	4.80	4.85	4.74			4.58	4.62	4.59	4.61
Nb	6.09	6.58	5.78	5.69	5.74	5.53	6	5.93	6.06	6.12
Nd	4.72	4.92	4.87	4.72	4.84	4.76	4.89	4.9	4.72	4.87
Ni	12.00	12.88	11.39	11.41	11.11	10.93	11.6	11.06	12.17	12.32
Os										
Pb	5.33	5.51	5.54	5.43	5.37	5.09	5.32	4.79	5.06	5.10
Pd	2.92	2.53								
Pr	4.61	4.58	4.50	4.43	4.31	4.32	4.53	4.52	4.40	4.51
Pt	0.83	0.91	0.99	0.99						
Rb	5.27	5.38	4.98	4.88	4.89	4.76	5.01	4.92	5.13	5.17
Re	1.08	1.05								
Rh										
Ru										
S										
Sb	2.91	2.88	4.63	4.54			4.43	4.28	4.30	4.26
Sc	6.29	6.70	5.01	4.97	7.36	7.16	5.28	5.28	4.27	4.36
Se										
Sm	4.60	4.87	4.68	4.62	4.54	5.01	4.71	4.64	4.49	4.67
Sn	5.18	5.79	4.00	4.00			4.87	4.53	5.27	4.55
Sr	29.47	27.33	27.91	27.50	23.79	23.56	28.18	27.81	27.00	28.00
Ta	4.78	4.91	4.43	4.34	4.55	4.64	4.63	4.65	4.68	4.84
Tb	4.40	4.52	4.44	4.40	4.14	4.18	4.53	4.58	4.35	4.49
Te										
Th	4.80	4.97	4.62	4.57	4.38	4.41	4.71	4.77	4.63	4.74
Tl	0.09	0.10	0.11	0.11					0.10	0.09
Tm	4.44	4.48	4.53	4.44	4.27	4.23	4.52	4.59	4.38	4.53
U	5.13	4.95	4.91	4.84	4.95	4.75	4.82	4.87	4.99	5.03
V	5.79	5.75	5.59	5.52	5.39	5.26	5.6	5.47	5.64	5.41
W	4.11	4.27	4.83	4.70			4.62	4.63	4.28	4.38
Y	5.46	5.26	5.42	5.39	4.78	4.80	5.46	5.46	5.40	5.55
Yb	4.76	5.25	4.95	4.96	4.78	4.73	4.93	4.97	4.73	4.81
Zn	10.69	10.25	10.89	10.66	10.96	9.87	11.49	11.12	8.27	8.72
Zr	11.09	11.29	11.37	11.19	9.63	9.73	11.44	11.27	11.33	11.56

Table 3 cont.

	GP-22	GP-22	GP-22	GP-22	GP-22	GP-22	GP-22	GP-22	GP-22	GP-22
	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS	LA-ICP-MS
Data quality	2	2	2	2	2	2	2	2	2	2
LAB ID	16	16	17	17	18	18	19	19	20	20
Oxide/element										
SiO2, %	55.7	55.7			56.23	56.32			55.96	55.95
TiO2	0.86	0.85	0.78	0.77	0.78	0.78	0.78	0.78	0.793	0.792
Al2O3	14.2	13.8			13.09	13.22			12.9	12.89
Fe2O3T	12.9	12.9			13.54	13.29			13.66	13.69
Fe(II)O										
MnO					0.05	0.05				
MgO	3.7	3.66			3.28	3.31			3.46	3.46
CaO	6.5	6.5			6.29	6.30			6.38	6.36
Na2O	4.31	4.23	4.25	4.19	3.75	3.75			3.83	3.85
K2O	2.72	2.71	3.01	2.93	2.22	2.38			2.53	2.53
P2O5	0.23	0.22	0.184	0.181	0.20	0.19	0.21	0.21	0.213	0.214
Ag, mg/kg	4.03	3.76					4.76	4.60	4.46	4.66
As					2.83	2.40	4.45	4.25	3.94	3.89
Au									0.83	0.85
B			10.7	10.6	10.88	9.80	6.87	6.86	8.88	8.84
Ba	6.26	6.24	5.89	5.9	5.87	5.95	5.92	5.88	5.88	5.87
Be			4.69	4.69			5.18	5.23	4.85	4.9
Bi	1.51	1.48	2.61	2.51			2.71	2.62	2.61	2.58
Br										
Cd	2.26	2.55					1.96	1.86		
Ce	4.69	4.79	4.67	4.58	4.53	4.60	4.76	4.70	4.72	4.7
Cl										
Co	4.24	4.32	4.55	4.45	4.26	4.34	4.35	4.36	4.3	4.32
Cr	11.6	12	11.7	11.6	9.66	9.57	9.77	9.56	10.26	10.35
Cs	3.59	3.74	3.63	3.54	3.35	3.29	3.51	3.52	3.47	3.47
Cu	6.18	6.05	6.37	6.28	5.89	7.15	5.95	5.91	6.4	6.3
Dy	4.66	4.83	4.16	4.22	4.06	4.15	4.86	4.89	4.54	4.52
Er	4.97	5.19	3.78	3.78	3.96	3.91	4.85	4.87	4.38	4.38
Eu	4.88	4.34	4.27	4.24	4.15	4.11	4.50	4.49	4.3	4.27
F										
Ga	17.8	18.3	20.3	20			18.43	18.13	18.1	18.1
Gd	5.67	5.51	3.95	4.04	4.00	4.00	4.93	4.96	4.5	4.52
Ge	3.65	3.45	6.02	5.79					3.88	3.87
Hf	5.32	5.26	4.14	4.13	4.20	4.23	4.80	4.84	4.44	4.42
Hg										
Ho	4.84	4.95	4.16	4.17	3.99	4.01	4.84	4.85	4.43	4.39
I										
In	3.69	3.73					3.56	3.48	3.44	3.44
Ir										
La	4.87	4.21	4.29	4.32	4.05	4.07	4.54	4.55	4.27	4.24
Li	10.3	10.1	11.1	10.7	10.16	9.71	9.77	9.68	6.52	9.54
Lu	6.1	5.99	4.32	4.35	4.25	4.37	5.16	5.17	4.75	4.74
Mn	333	315	333	328	327.84	326.07	344.79	342.94	322.5	321.8
Mo	4.28	4.24	4.51	4.3	4.20	4.26	4.75	4.62	4.47	4.52
Nb	6.79	6.61	5.18	5.13	5.52	5.48	5.79	5.80	5.81	5.78
Nd	5.87	5.8	4.77	4.77	4.52	4.35	4.96	4.96	4.73	4.7
Ni	11.6	11.3	12.4	12.2	11.28	11.43	11.38	11.45	11.19	11.09
Os										
Pb	4.7	4.68	5.06	4.85	4.70	4.54	5.13	5.05	5.02	5.05
Pd										
Pr	4.99	4.51	4.3	4.26	4.27	4.25	4.55	4.53	4.41	4.38
Pt									0.83	0.81
Rb	4.96	4.92	5.57	5.46	4.99	4.94	4.93	4.91	4.9	4.9
Re										
Rh										
Ru										
S										
Sb			3.99	3.86	2.98	4.24	4.56	4.50	4.44	4.46
Sc	5.25	5.15	4.96	4.91	5.60	5.48	4.93	4.99	4.49	4.49
Se										
Sm	4.86	4.82	4.43	4.5	4.19	4.19	4.81	4.82	4.52	4.51
Sn	6.37	6.07	8.03	8.41	3.92	3.79	4.52	4.40	3.61	3.59
Sr	29.3	30.1	25.8	25.5	26.60	26.28	27.86	27.93	26.89	26.79
Ta	5.4	5.43	3.63	3.63	3.92	3.95	4.51	4.50	4.43	4.43
Tb	4.91	4.91	4.18	4.21	3.90	3.94	4.65	4.68	4.36	4.33
Te										
Th	5.58	5.58	4.35	4.35	4.12	4.23	5.06	5.06	4.55	4.52
Tl										
Tm			3.87	3.91	3.95	3.91	4.69	4.70	4.35	4.32
U	4.5	4.65	5.07	4.9	4.53	4.56	4.64	4.57	4.7	4.69
V	5.32	5.24	5.39	5.3	5.34	5.39	5.53	5.45	5.35	5.35
W	5.01	4.68					4.77	4.66	4.56	4.55
Y	6.69	7.57	4.61	4.59	4.66	4.66	5.73	5.77	5.3	5.31
Yb	5.71	5.86	4.54	4.62	4.21	4.21	5.10	5.14	4.73	4.73
Zn	8.89	8.91	11	10.7	10.39	12.36	9.39	9.42	8.75	8.68
Zr	13.6	14.5	10.2	10.3	10.03	9.65	11.81	11.94	11	10.92

Table 3 cont.

Data quality	GP-22 LA-ICP-MS 2	GP-22 LA-ICP-MS 2	GP-22 LA-ICP-MS 2	GP-22 LA-ICP-MS 2	GP-22 LA-ICP-MS 2	GP-22 SEM 2	GP-22 SEM 2	GP-22 SEM 2	GP-22 SEM 2
LAB ID	21	21	22	23	23	12A	12A	24	24
Oxide/element									
SiO2, %				53.84	53.62	56.817	56.901	55.639	55.548
TiO2			0.86	0.77	0.77	0.899	0.886	0.826	0.815
Al2O3			13.68	13.01	12.95	13.206	13.242	12.970	12.949
Fe2O3T				12.39	12.38			13.667	13.646
Fe(II)O						12.116	12.030		
MnO			0.04	0.05	0.05	0.042	0.039		
MgO			3.88	3.07	3.05	4.156	4.172	3.505	3.495
CaO			6.57			6.562	6.523	6.520	6.507
Na2O			3.82	3.69	3.68	3.802	3.833	3.898	3.883
K2O			2.58	2.44	2.43	2.648	2.642	2.553	2.534
P2O5						0.092	0.090		
Ag, mg/kg			5.423	4.66	4.39				
As			4.134	2.85	2.85				
Au			0.8959						
B			17.006						
Ba	6.10	5.81	5.982	5.91	5.75				
Be			4.594	5.27	5.16				
Bi	2.21	2.14	2.5606	2.54	2.49				
Br									
Cd			2.307	1.28	1.27				
Ce	5.06	4.53	4.6742	4.75	4.82				
Cl									
Co			4.425	4.32	4.23				
Cr			9.893	10.02	10.22				
Cs			3.3481	3.33	3.37				
Cu			7.582	5.85	5.89				
Dy	4.37	4.12	4.41	4.66	4.71				
Er	4.19	4.01	4.242	4.71	4.62				
Eu	4.25	3.88	4.217	4.43	4.32				
F									
Ga	14.62	14.45	18.237	17.14	17.31				
Gd	4.12	3.85	4.332	4.76	4.52				
Ge	4.30	3.95	6.881	4.14	4.06				
Hf	4.45	4.15	4.492	4.60	4.58				
Hg									
Ho	4.02	3.98	4.5036	4.62	4.57				
I									
In	3.04	3.10	3.907	3.36	3.29				
Ir									
La	4.81	4.13	4.248	4.35	4.32				
Li			10.216	9.48	9.53				
Lu	4.38	4.26	4.7276	4.91	4.81				
Mn			337.96	340.85	339.30				
Mo	4.26	4.67	4.552	4.18	4.42				
Nb	6.73	5.43	5.689	5.75	5.70				
Nd	4.60	4.28	4.573	4.69	4.81				
Ni			11.63	11.21	11.24				
Os									
Pb			5.112	4.97	4.93				
Pd									
Pr	4.13	4.12	4.375	4.42	4.40				
Pt									
Rb			4.908	4.80	4.73				
Re			0.919						
Rh									
Ru									
S									
Sb			4.072	4.35	4.32				
Sc			18.434	9.60	9.44				
Se									
Sm	4.08	4.16	4.424	4.63	4.63				
Sn			4.876	3.85	3.75				
Sr			27.402	27.48	26.86				
Ta	5.16	3.98	4.3055	4.34	4.30				
Tb	4.04	3.94	4.364	4.46	4.41				
Te				258.75	252.50				
Th			4.5039	4.43	4.47				
Tl			0.0852	0.08	0.09				
Tm	3.96	3.82	4.3158	4.48	4.51				
U			4.696	4.79	4.74				
V			5.493	5.54	5.45				
W	4.08	4.55	4.392	4.55	4.48				
Y	5.83	4.73	5.07	5.46	5.34				
Yb	4.51	4.15	4.761	4.79	4.80				
Zn			13.04	10.45	10.62				
Zr	13.39	10.43	10.729	11.27	11.04				

Table 3 cont.

	GP-22 SEM	GP-22 SEM	GP-22 SEM	GP-22 SEM	GP-22 EPMA	GP-22 EPMA	GP-22 EPMA	GP-22 EPMA	GP-22 EPMA	GP-22 EPMA
Data quality	2	2	2	2	2	2	2	2	2	2
LAB ID	25	25	26	26	27	27	28	28	13A	13A
Oxide/element										
SiO2, %	55.62	56.015	58.622	58.641	55.831	55.910	55.603	55.647	55.924	55.965
TiO2	0.84	0.84	0.811	0.795	0.765	0.751	0.846	0.844	0.821	0.8
Al2O3	13.16	13.245	12.769	12.739	13.408	13.456	13.538	13.592	13.52	13.519
Fe2O3T	13.66	13.695			13.609	13.540	13.052	13.040		
Fe(II)O			11.751	11.829					12.169	12.168
MnO					0.043	0.045	0.043	0.043		
MgO	3.45	3.515	3.482	3.447	3.508	3.507	3.557	3.531	3.445	3.464
CaO	6.63	6.645	6.386	6.425	6.458	6.427	6.547	6.546	6.435	6.552
Na2O	3.54	3.56	3.634	3.571	3.605	3.625	3.638	3.637	3.926	3.925
K2O	2.6	2.6	2.547	2.555	2.540	2.512	2.549	2.553	2.537	2.528
P2O5	0.13	0.135			0.205	0.201	0.203	0.205	0.207	0.211
Ag, mg/kg										
As										
Au										
B										
Ba										
Be										
Bi										
Br										
Cd										
Ce										
Cl					0.0689044					
Co										
Cr										
Cs										
Cu										
Dy										
Er										
Eu										
F										
Ga										
Gd										
Ge										
Hf										
Hg										
Ho										
I										
In										
Ir										
La										
Li										
Lu										
Mn										
Mo										
Nb										
Nd										
Ni										
Os										
Pb										
Pd										
Pr										
Pt										
Rb										
Re										
Rh										
Ru										
S										
Sb										
Sc										
Se										
Sm										
Sn										
Sr										
Ta										
Tb										
Te										
Th										
Tl										
Tm										
U										
V										
W										
Y										
Yb										
Zn										
Zr										

Table 3 cont.

	GP-22 EPMA	GP-22 EPMA	GP-22 EPMA	GP-22 EPMA	GP-22 EPMA	GP-22 EPMA	GP-22 EPMA	GP-22 EPMA	GP-21 EPMA	GP-21 EPMA
Data quality	2	2	2	2	2	2	2	2	2	2
LAB ID	29	29	30	30	19A	19A	17A	17A	31	31
Oxide/element										
SiO2, %	56.76	56.82	55.800	55.556	56.406	56.434	56.46	56.52	55.341	55.041
TiO2	0.83	0.82	0.827	0.831					0.832	0.826
Al2O3	13.62	13.55	13.450	13.385	13.524	13.540	12.85	12.83	13.475	13.408
Fe2O3T					13.135	13.166	13.08	13.01	13.454	13.471
Fe(II)O	11.99	12.02	12.064	12.124						
MnO	0.04	0.04	0.033	0.040					0.045	0.037
MgO	3.66	3.67	3.519	3.536	3.512	3.524	3.39	3.39	3.6	3.583
CaO	6.62	6.65	6.499	6.529	6.519	6.517	6.54	6.56	6.465	6.451
Na2O	3.51	3.52	3.827	3.751	3.792	3.791			3.769	3.735
K2O	2.60	2.60	2.529	2.516	2.496	2.489			2.686	2.686
P2O5	0.21	0.21	0.209	0.204					0.187	0.193
Ag, mg/kg										
As										
Au										
B										
Ba										
Be										
Bi										
Br										
Cd										
Ce										
Cl			247.49	225.10						
Co										
Cr										
Cs										
Cu										
Dy										
Er										
Eu										
F										
Ga										
Gd										
Ge										
Hf										
Hg										
Ho										
I										
In										
Ir										
La										
Li										
Lu										
Mn										
Mo										
Nb										
Nd										
Ni										
Os										
Pb										
Pd										
Pr										
Pt										
Rb			54.48	27.30						
Re										
Rh										
Ru										
S			47.20	57.32						
Sb										
Sc										
Se										
Sm										
Sn										
Sr			63.83	67.29						
Ta										
Tb										
Te										
Th										
Tl										
Tm										
U										
V										
W										
Y										
Yb										
Zn										
Zr			21.60	16.47						

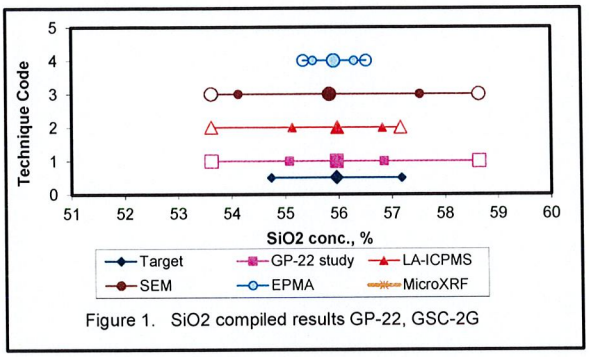

Figure 1. SiO2 compiled results GP-22, GSC-2G

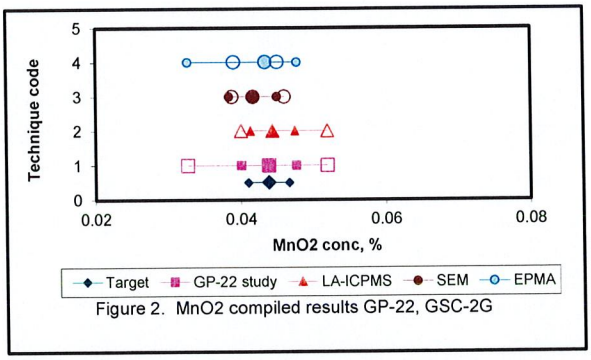

Figure 2. MnO2 compiled results GP-22, GSC-2G

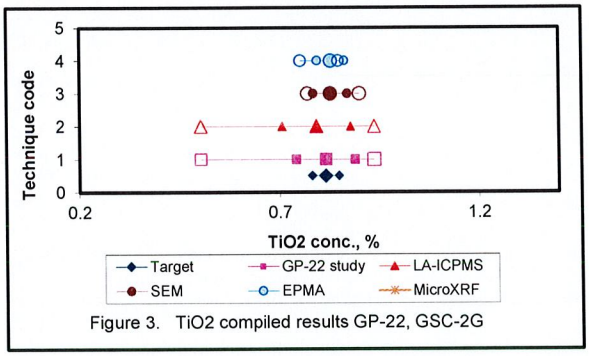

Figure 3. TiO2 compiled results GP-22, GSC-2G

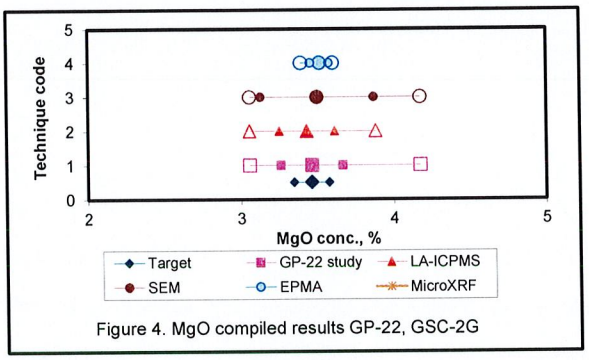

Figure 4. MgO compiled results GP-22, GSC-2G

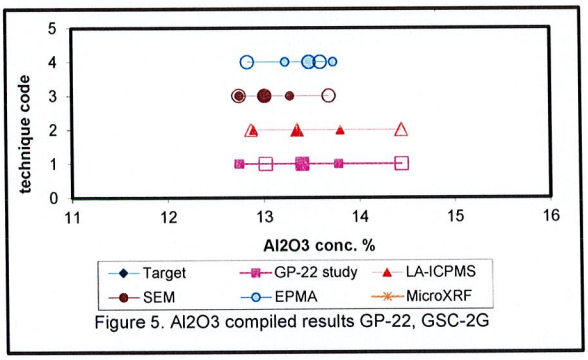

Figure 5. Al2O3 compiled results GP-22, GSC-2G

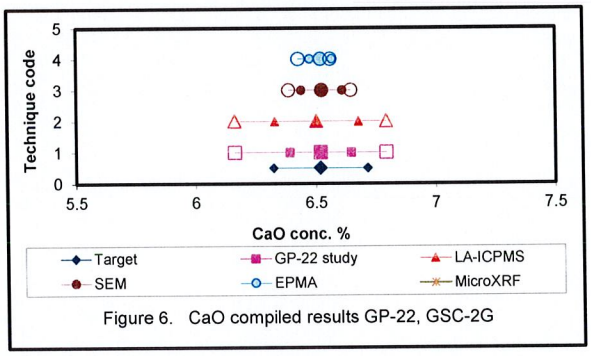

Figure 6. CaO compiled results GP-22, GSC-2G

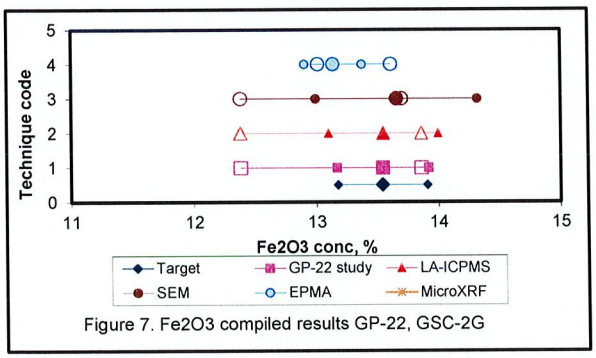

Figure 7. Fe2O3 compiled results GP-22, GSC-2G

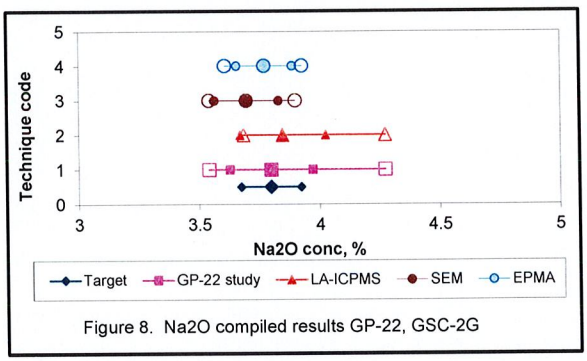

Figure 8. Na2O compiled results GP-22, GSC-2G

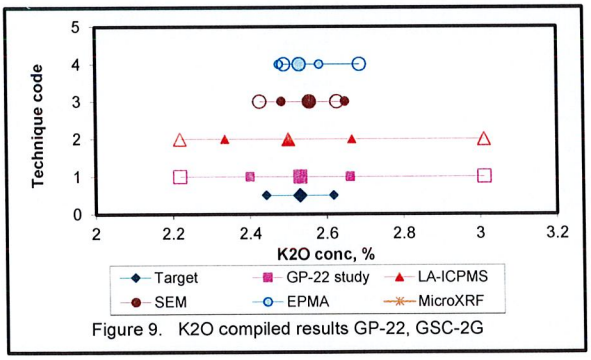

Figure 9. K2O compiled results GP-22, GSC-2G

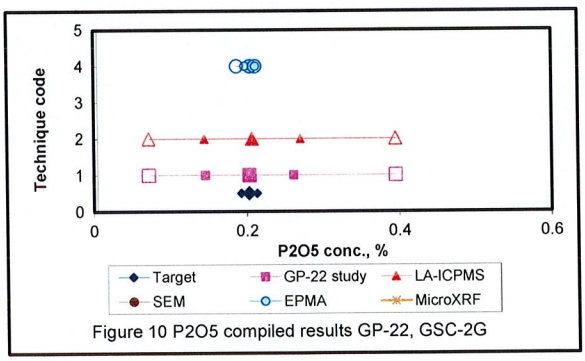

Figure 10 P2O5 compiled results GP-22, GSC-2G

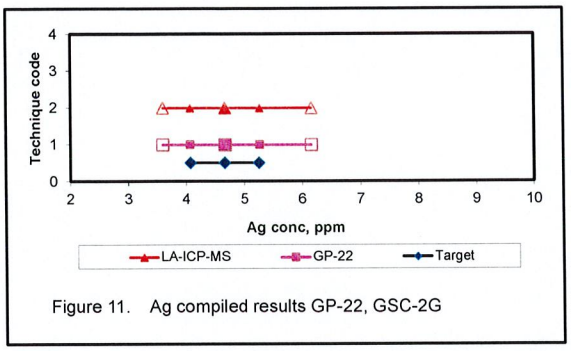

Figure 11. Ag compiled results GP-22, GSC-2G

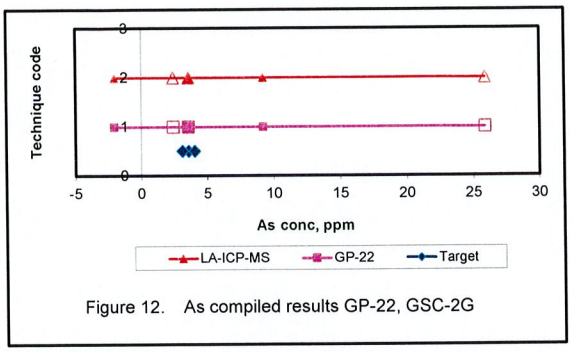

Figure 12. As compiled results GP-22, GSC-2G

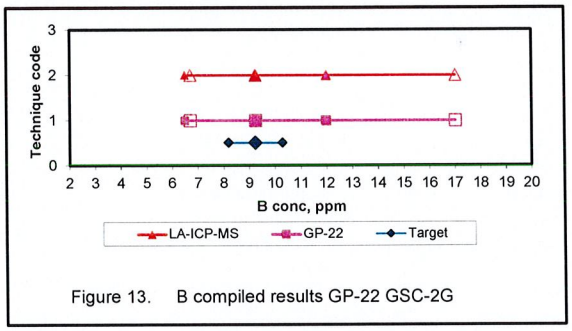

Figure 13. B compiled results GP-22 GSC-2G

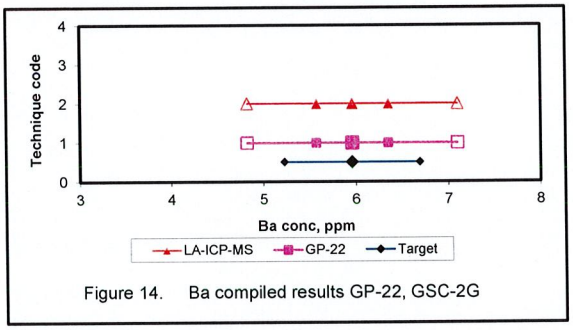

Figure 14. Ba compiled results GP-22, GSC-2G

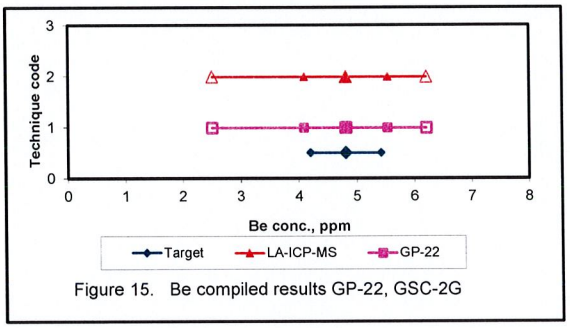

Figure 15. Be compiled results GP-22, GSC-2G

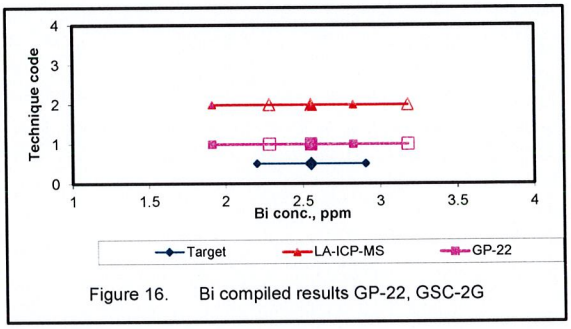

Figure 16. Bi compiled results GP-22, GSC-2G

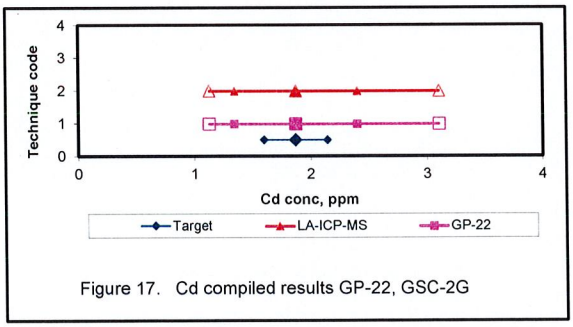

Figure 17. Cd compiled results GP-22, GSC-2G

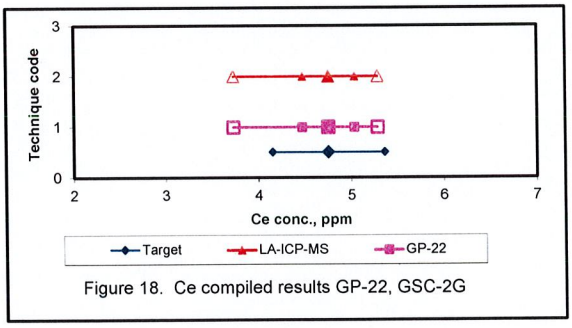

Figure 18. Ce compiled results GP-22, GSC-2G

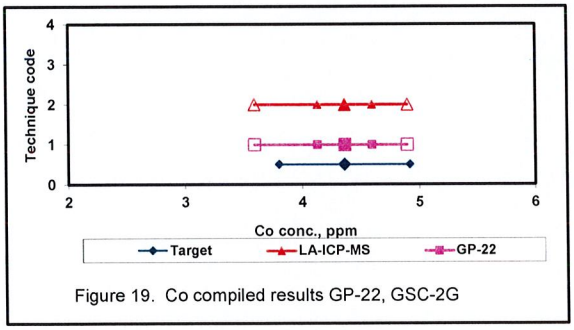

Figure 19. Co compiled results GP-22, GSC-2G

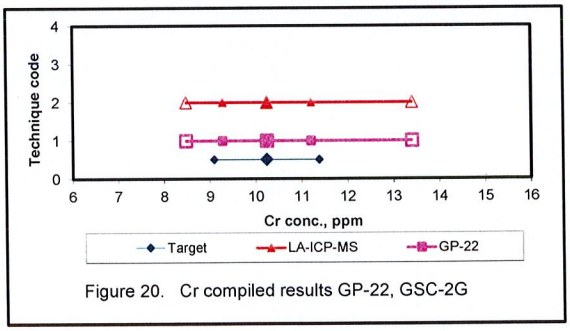

Figure 20. Cr compiled results GP-22, GSC-2G

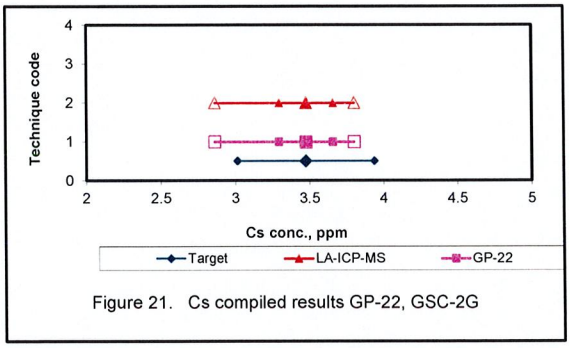

Figure 21. Cs compiled results GP-22, GSC-2G

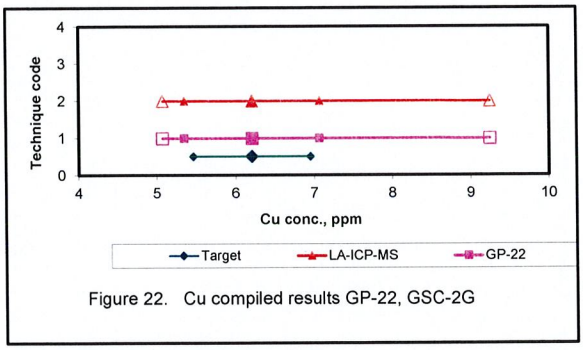

Figure 22. Cu compiled results GP-22, GSC-2G

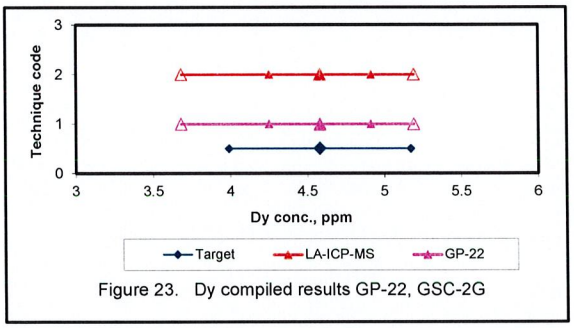

Figure 23. Dy compiled results GP-22, GSC-2G

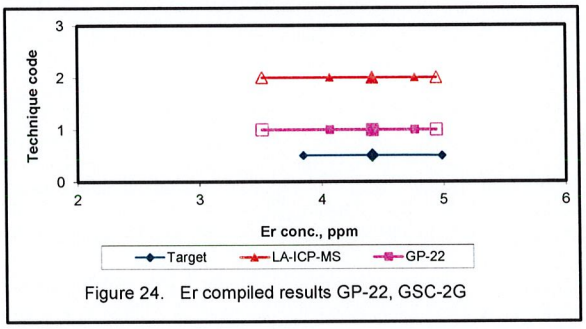

Figure 24. Er compiled results GP-22, GSC-2G

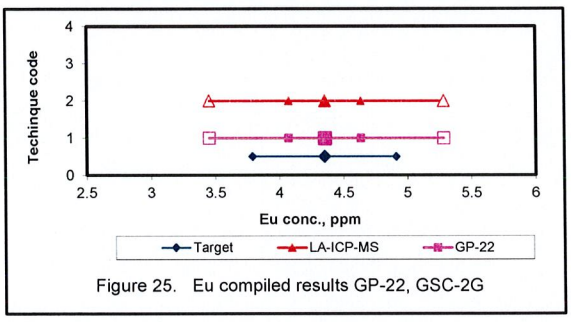

Figure 25. Eu compiled results GP-22, GSC-2G

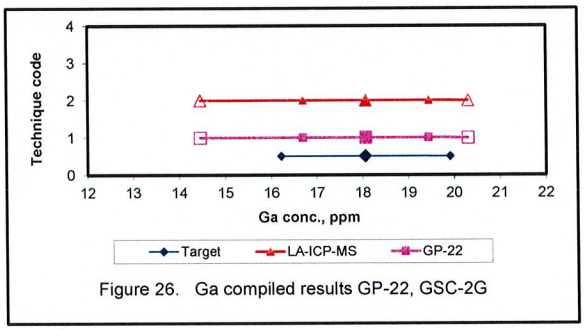

Figure 26. Ga compiled results GP-22, GSC-2G

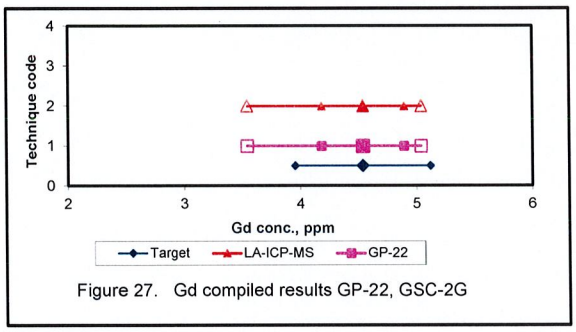

Figure 27. Gd compiled results GP-22, GSC-2G

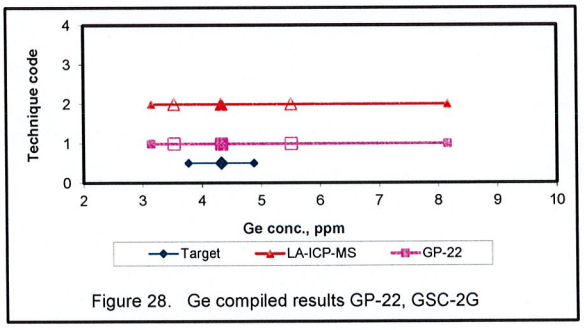

Figure 28. Ge compiled results GP-22, GSC-2G

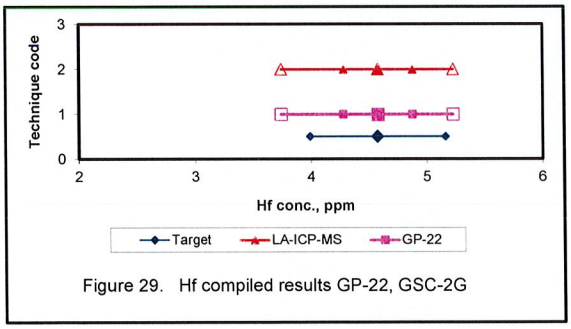

Figure 29. Hf compiled results GP-22, GSC-2G

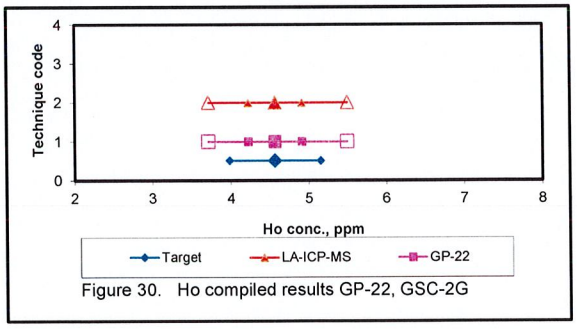

Figure 30. Ho compiled results GP-22, GSC-2G

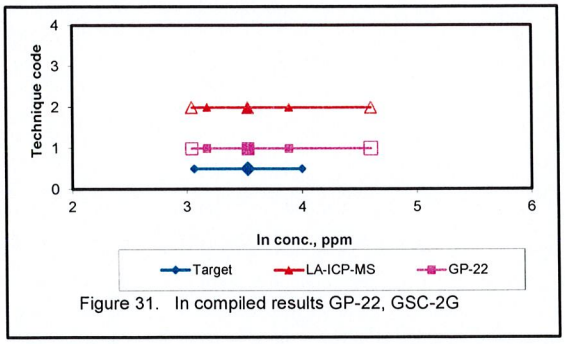

Figure 31. In compiled results GP-22, GSC-2G

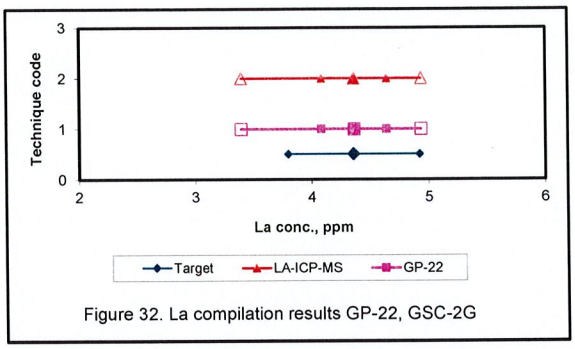

Figure 32. La compilation results GP-22, GSC-2G

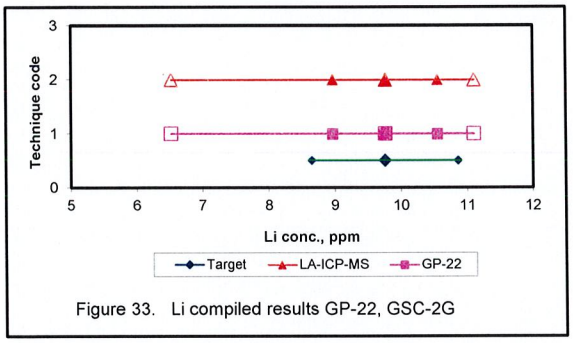

Figure 33. Li compiled results GP-22, GSC-2G

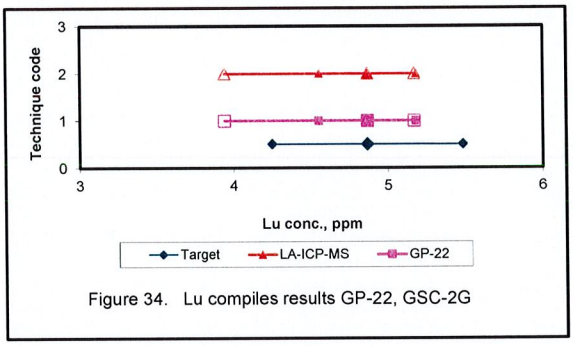

Figure 34. Lu compiles results GP-22, GSC-2G

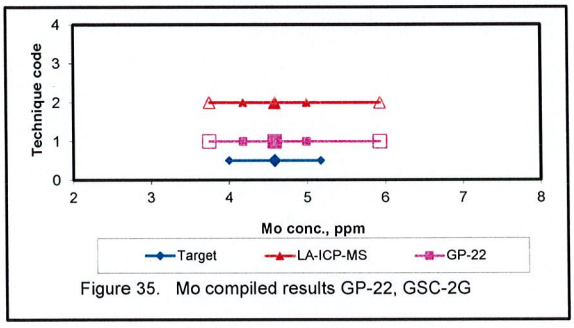

Figure 35. Mo compiled results GP-22, GSC-2G

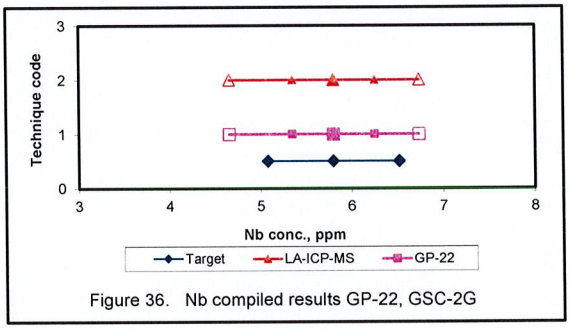

Figure 36. Nb compiled results GP-22, GSC-2G

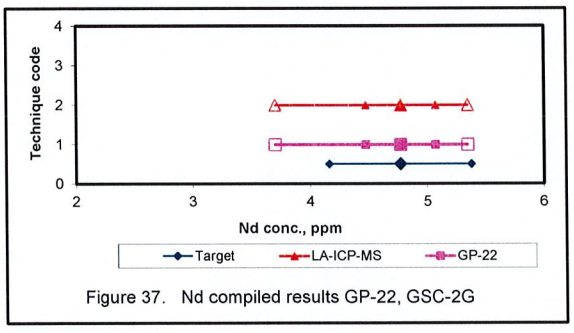

Figure 37. Nd compiled results GP-22, GSC-2G

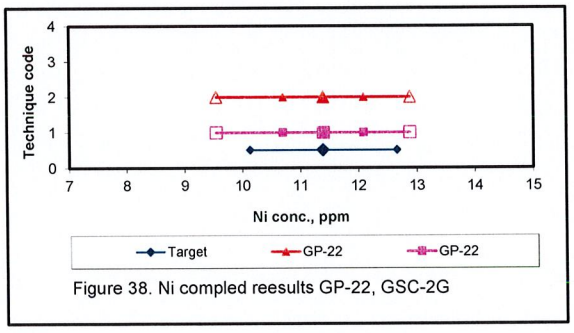

Figure 38. Ni compled reesults GP-22, GSC-2G

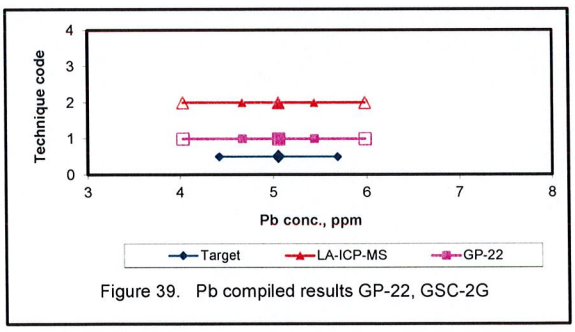

Figure 39. Pb compiled results GP-22, GSC-2G

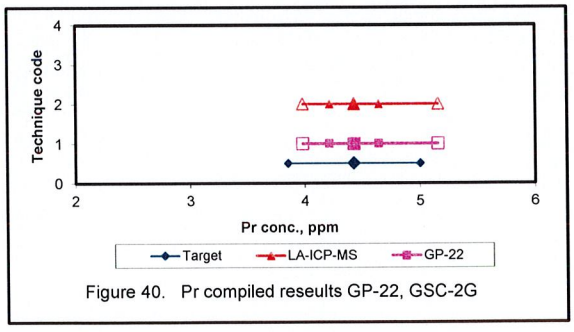

Figure 40. Pr compiled reseults GP-22, GSC-2G

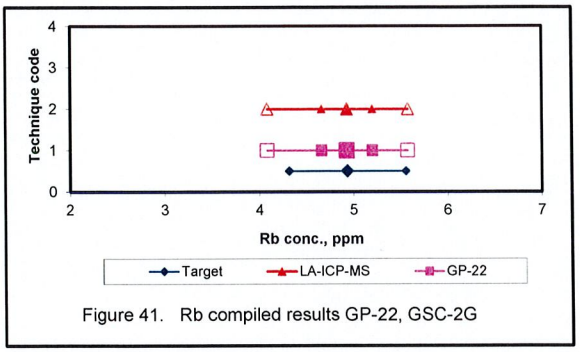

Figure 41. Rb compiled results GP-22, GSC-2G

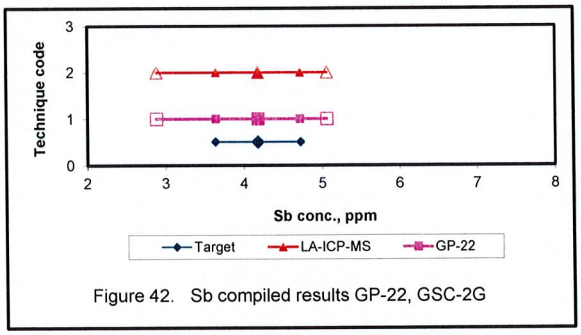

Figure 42. Sb compiled results GP-22, GSC-2G

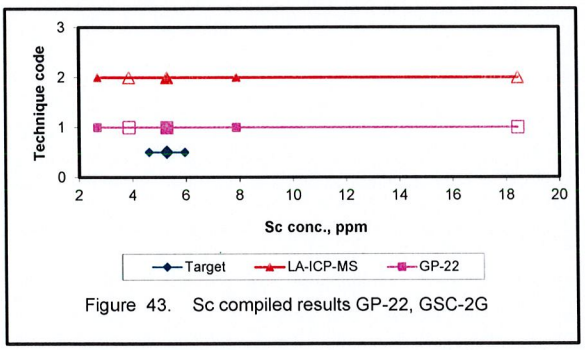

Figure 43. Sc compiled results GP-22, GSC-2G

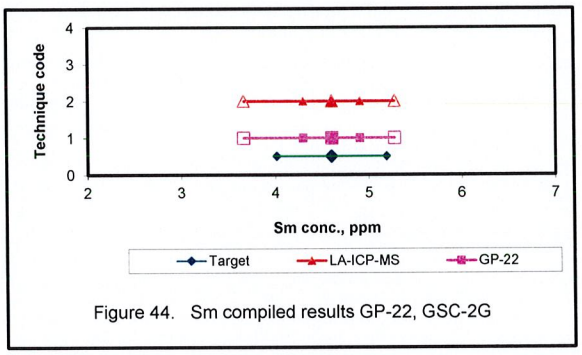

Figure 44. Sm compiled results GP-22, GSC-2G

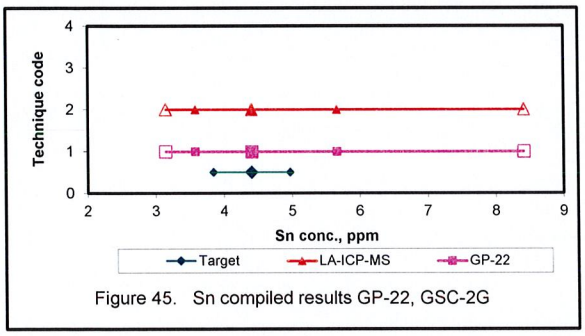

Figure 45. Sn compiled results GP-22, GSC-2G

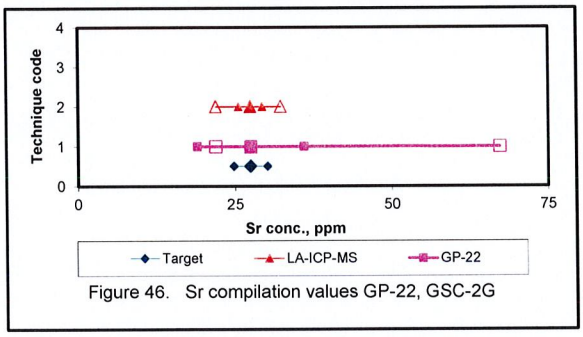

Figure 46. Sr compilation values GP-22, GSC-2G

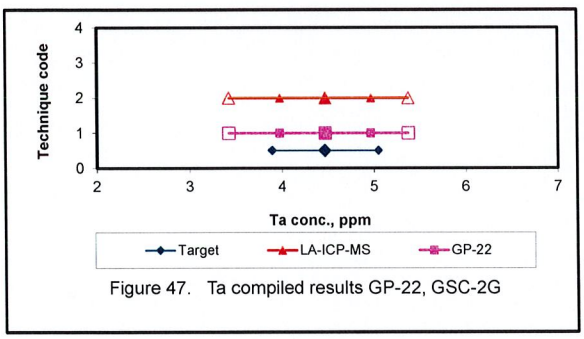

Figure 47. Ta compiled results GP-22, GSC-2G

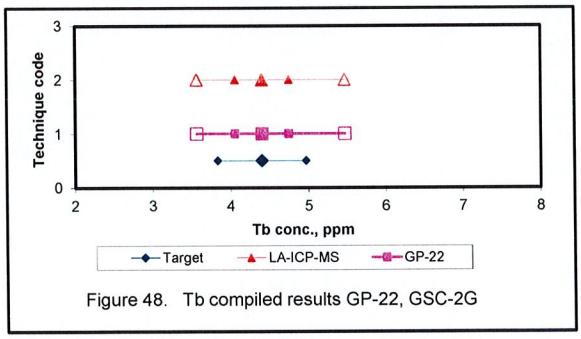

Figure 48. Tb compiled results GP-22, GSC-2G

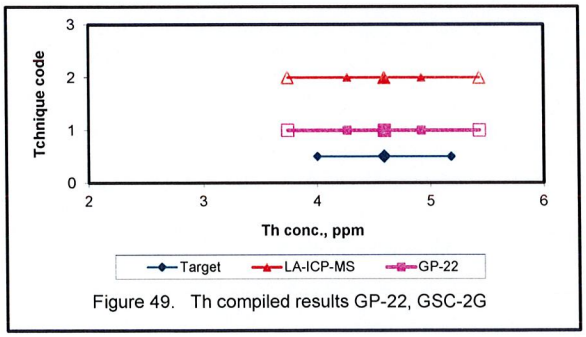

Figure 49. Th compiled results GP-22, GSC-2G

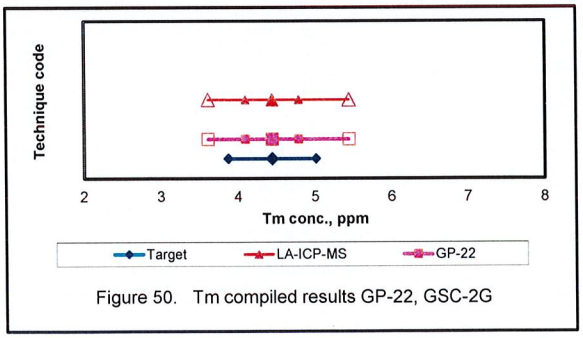

Figure 50. Tm compiled results GP-22, GSC-2G

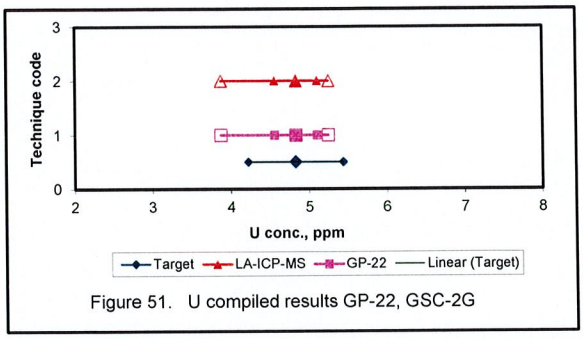

Figure 51. U compiled results GP-22, GSC-2G

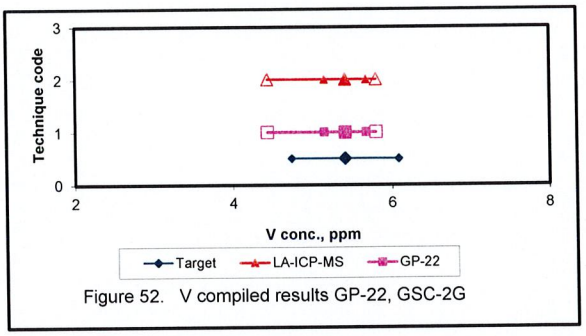

Figure 52. V compiled results GP-22, GSC-2G

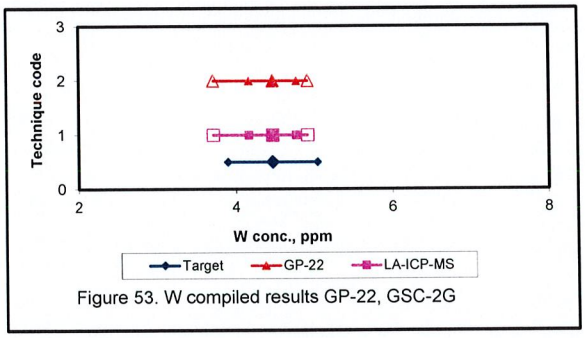

Figure 53. W compiled results GP-22, GSC-2G

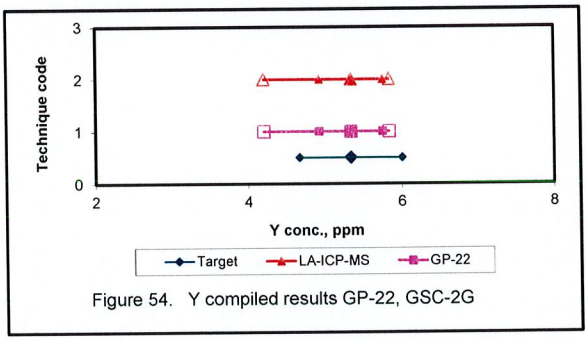

Figure 54. Y compiled results GP-22, GSC-2G

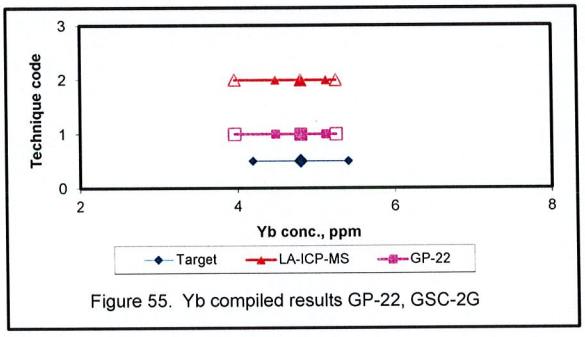

Figure 55. Yb compiled results GP-22, GSC-2G

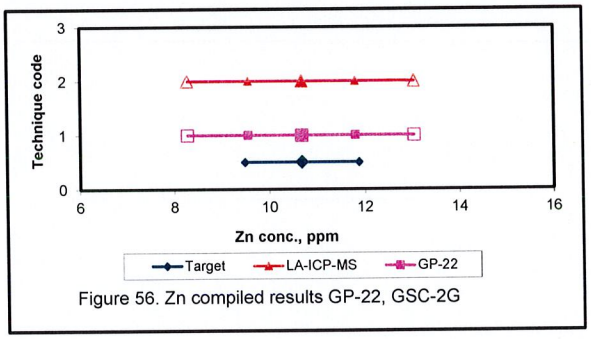

Figure 56. Zn compiled results GP-22, GSC-2G

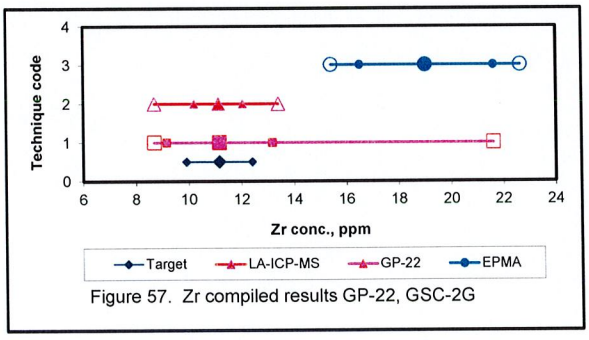

Figure 57. Zr compiled results GP-22, GSC-2G