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TABULATION OF GEOCHEMICAL DATA
FURNISHED BY 109 LABORATORIES FOR
SIX GEOCHEMICAL EXPLORATION REFERENCE SAMPLES

By Glenn H. Allcott and Hubert W. Lakin

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CONTENTS

	Page
Introduction-----	vii
Description of the geochemical exploration reference samples-----	vii
Sample one (GXR1)-----	vii
Sample two (GXR2)-----	vii
Sample three (GXR3)-----	vii
Sample four (GXR4)-----	vii
Sample five (GXR5)-----	vii
Sample six (GXR6)-----	viii
Preparation of the samples-----	viii
References-----	viii

TABLES

Table 1. Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure-----	1-51
2. Additional results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver in parts per million (ppm). Data not included in table 1-----	52-54
3. Analytical results obtained by X-ray fluorescence for copper, zinc, lead, nickel, cobalt, and silver in parts per million (ppm)-----	55-57
4. Analytical results obtained by colorimetry for copper, zinc, lead, nickel, and cobalt in parts per million (ppm)-----	58-60

CONTENTS--Continued

TABLES--Continued

	Page
Table 5. Analytical results for 29 elements obtained by emission spectrography: iron, magnesium, calcium, titanium, manganese, silver, arsenic, boron, barium, beryllium, bismuth, cadmium, cobalt, chromium, copper, molybdenum, nickel, lead, tin, vanadium, tungsten, zinc, zirconium, lanthanum, niobium, antimony, scandium, strontium, yttrium-----	61-93
6. Analytical results for gallium, germanium, cerium, rubidium, and aluminum obtained by emission spectrography-----	94-95
7. Analytical results for lithium obtained by atomic absorption and flame emission spectrography in parts per million (ppm)-----	96-97
8. Analytical results for rubidium obtained by atomic absorption and X-ray fluorescence in parts per million (ppm)-----	98
9. Analytical results for cesium by atomic absorption in parts per million (ppm)-----	99
10. Analytical results for beryllium by atomic absorption and colorimetry in parts per million (ppm)-----	100
11. Analytical results for strontium by X-ray fluorescence and atomic absorption in parts per million (ppm)-----	101
12. Analytical results for barium by atomic absorption, X-ray fluorescence, and turbidimetry in parts per million (ppm)-----	102-103
13. Analytical results for zirconium by X-ray fluorescence in parts per million (ppm)-----	104

CONTENTS--Continued

TABLES--Continued

	Page
Table 14. Analytical results for vanadium by atomic absorption, X-ray fluorescence and colorimetry in parts per million (ppm)---	105
15. Analytical results for niobium by atomic absorption and X-ray fluorescence in parts per million (ppm)-----	106
16. Analytical results for chromium by atomic absorption and X-ray fluorescence in parts per million (ppm)-----	107-110
17. Analytical results for molybdenum by atomic absorption, colorimetry, and X-ray fluorescence in parts per million (ppm)-----	111-120
18. Analytical results for tungsten by atomic absorption, colorimetry, and X-ray fluorescence in parts per million (ppm)-----	121-124
19. Analytical results for gold by atomic absorption, fire assay, and colorimetry in parts per million (ppm)-----	125-128
20. Analytical results for cadmium by atomic absorption in parts per million (ppm)-----	129-131
21. Analytical results for mercury by colorimetry, flameless atomic absorption, and flameless atomic fluorescence in parts per million (ppm)-----	132-133
22. Analytical results for tin by atomic absorption, colorimetry, and X-ray fluorescence in parts per million (ppm)-----	134-135
23. Analytical results for arsenic by atomic absorption, colorimetry, titration, X-ray fluorescence, and paper chromatography in parts per million (ppm)-----	136-139

CONTENTS--Continued

TABLES--Continued

	Page
Table 24. Analytical results for boron by colorimetry in parts per million (ppm)-----	140
25. Analytical results for antimony by atomic absorption, colorimetry, and X-ray fluorescence in parts per million (ppm)-----	141-143
26. Analytical results for bismuth by atomic absorption and colorimetry in parts per million (ppm)-----	144-145
27. Analytical results for fluorine by colorimetry and selective ion electrode in parts per million (ppm)-----	146
28. Analytical results for uranium by colorimetry, fluorimetry, neutron activation and paper chromatography in parts per million (ppm)-----	147-148
29. Analytical results for magnesium by atomic absorption, X-ray fluorescence, titration, and unidentified method in percent (%)-----	149-151
30. Analytical results for calcium by atomic absorption, X-ray fluorescence, titration, and unidentified method in percent (%)-----	152-155
31. Analytical results for titanium by atomic absorption, X-ray fluorescence, colorimetry, and unidentified method in parts per million (ppm)-----	156-157
32. Analytical results for manganese by atomic absorption, X-ray fluorescence, colorimetry, and unidentified method in parts per million (ppm)-----	158-168

CONTENTS--Continued

TABLES--Continued

	Page
Table 33. Analytical results for silica (SiO_2) by atomic absorption, spectrophotometry, gravimetry, X-ray fluorescence, and unidentified method in percent (%)-----	169-170
34. Analytical results for ferric oxide (Fe_2O_3) by atomic absorption, X-ray fluorescence, titration, colorimetry, and unidentified method in percent (%)-----	171-178
35. Analytical results for aluminum oxide (Al_2O_3) by atomic absorption, X-ray fluorescence, titration, and unidentified method in percent (%)-----	179-181
36. Analytical results for sodium oxide (Na_2O) by atomic absorption, X-ray fluorescence, flame photometry, and unidentified method in percent (%)-----	182-183
37. Analytical results for potassium oxide (K_2O) by atomic absorption, X-ray fluorescence, flame photometry, flame emission and unidentified method-----	184-186
38. Analytical results for phosphorous pentoxide (P_2O_5) by colorimetry, X-ray fluorescence and unidentified method in percent (%)-----	187
39. Analytical results for sulfur by titration and X-ray fluorescence in percent (%)-----	188
40. Analytical results for total carbon as carbon dioxide (CO_2), loss on ignition, H_2O^+ and H_2O^- , all in percent (%)-----	189
41. Analytical results for thorium, tellurium, platinum and palladium in parts per million (ppm)-----	190

CONTENTS--Continued

TABLES--Continued

	Page
Table 42. Supplemental data on copper, zinc, lead, nickel, cobalt, silver, and gold by atomic absorption; molybdenum by colorimetry-----	191-192
43. Laboratories furnishing data listed in preceding tables----	193-199

Tabulation of geochemical data furnished by 109 laboratories
for six geochemical exploration reference samples

By Glenn H. Allcott and Hubert W. Lakin

INTRODUCTION

All of the data are tabulated here (Table 1-43) that we have received through August, 1977 on the six reference samples that were sent to 247 laboratories. Data were received from 109 laboratories.

The data are tabulated by method of analysis and by element.

For the convenience of the user of these tables the description of the reference samples and method of preparation originally published by Allcott and Lakin (1975) are given below:

Geochemical exploration reference sample one (GXR1)

The sample was collected from the Drum Mountains, Juab County, Utah, by J. H. McCarthy, Jr. The Drum Mountains are a typical faulted range of the Basin and Range province of the southwestern United States. Gold, copper, and manganese deposits have been mined in the area. This sample is a composite of three samples from two outcrops of jasperoid "reefs" in Cambrian limestone. The jasperoid "reefs" range from crystalline to cryptocrystalline in internal structure and from gray to reddish brown in color.

Geochemical exploration reference sample two (GXR2)

The sample was collected from the Park City mining district, Summit County, Utah, by J. H. McCarthy, Jr. The Park City mining district on the eastern slope of the Wasatch Range has produced lead, zinc, silver, and copper from fissure veins and from replacements in limestone. The sample is a composite of residual, gray-brown loams (Munsell color chart 5/2 of hue 10YR) from four sites along a line approximately 0.8 km long. The shallow soil varies from 18 to 30 cm in depth and overlies a thick-bedded Weber Quartzite of Pennsylvanian age.

Geochemical exploration reference sample three (GXR3)

The sample was collected from a hot spring deposit in Humboldt County, Nevada, by S. P. Marsh. Tungsten was produced from these deposits during the 1940's. It is a composite of red-brown to black, earthy, Fe-Mn-rich material, cementing and replacing coarse alluvium on a bedrock surface of intensely deformed phyllitic shale of the Preble Formation of Cambrian age. Calcareous tufa commonly caps the mineralized material.

Geochemical exploration reference sample four (GXR4)

The sample was furnished by Kennecott Copper Corporation from their mine in Utah. It is a mill head sample of unoxidized porphyry copper ore composed primarily of quartz and feldspar with minor amounts of andradite garnet, biotite, muscovite-illite, and sulfide minerals.

Geochemical exploration reference sample five (GXR5)

The sample was collected from Somerset County, Maine, an area subjected to continental glaciation during the Pleistocene, by F. C. Canney. It is a composite from three sample sites of the B zone of moderately well developed podzol soils formed on a thin (< 1m) basal glacial till. The bedrock underlying the collection sites is: (1) a highly silicified and sericitized quartz

monzonite containing abundant disseminated chalcopyrite, molybdenite, and pyrite; (2) a mineralized norite containing abundant pyrrhotite, and minor chalcopyrite and pentlandite; and (3) peridotite and altered norite containing abundant pyrrhotite, chalcopyrite, and pentlandite.

Geochemical exploration reference sample six (GXR6)

The sample was collected from Davidson County, North Carolina, an area once active in gold and base-metal mining, by Henry Bell and A. A. Stromquist. It is a composite of three samples, obtained at depths of 15-45 cm, of residual, B-zone, yellowish-red (Munsell color chart 5/8 of hue 5YR) soil. Two samples are from within the Silver Hill-Gold Hill fault shear zone, where the soils are derived from sericitized mudstone and phyllite that are slightly anomalous in lead, zinc, silver, copper, barium, and molybdenum. The third sample of the composite is from a cross shear, underlain in part by rhyolitic rock and in part by andesitic basalt, which here are slightly anomalous in arsenic and gold.

PREPARATION OF THE SAMPLES

The first step in the preparation of the samples to be used for analysis was to reduce the particle size of the six approximately 450-kg bulk samples. It was desirable to reduce the sample to 100 percent minus 200-mesh, because it was shown by Smith and others (1929) that a uniform sample that has been ground to pass a 200-mesh sieve cannot be made heterogeneous by jarring or by vibrational storage conditions, regardless of the difference in the density of the components. The bulk rock samples were crushed to pass a 5-mesh sieve. The bulk soil samples were passed through a 10-mesh sieve, and the plus 10-mesh fraction discarded. Each of the six bulk samples was then ground for 12 hours in an aluminum oxide ceramic-lined mill with aluminum oxide ceramic balls. During this period the sample was heated by friction to temperatures between 80° and 90°C, which may have caused a partial loss of some volatile elements. After opening, the mill was run an additional 1.5 hours to dump the sample into a receiving hopper. A wet mechanical analysis of each of the milled samples demonstrated that over 97 percent of every sample had been ground to pass a 44- μ (325-mesh) opening.

REFERENCES

- Allcott, Glenn H., and Lakin, Hubert W., 1975, The Homogeneity of six Geochemical Exploration References samples in Elliott, I. L. and Fletcher, W. K., eds., *Geochemical Exploration 1974: Proc. Fifth Geochemical Exploration Symposium*, Vancouver, B.C., Canada, April 1-4, 1974, p. 659-681.
- Smith, G. F., Hardy, L. V., and Gard, E. L., 1929, The segregation of analyzed samples: *Ind. Eng. Chem., Anal. Ed.*, vol. 1, no. 4, p. 228-230.

ABBREVIATIONS

ARL Applied Research Laboratories
P. E. Perkin Elmer
Tech. Techtron
ARL Applied Research Laboratories
I. L. Instrumentation Laboratory
EEL Evans Electro Selenium Ltd.
V. Varian

Leaders (--) mean no data.

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure
 [All results are in parts per million (ppm)]

Concentrated nitric acid digestion

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
39	Hot nitric acid	Not given	None	Tech. AA 5	10	1065	64	17	6195	407	69
39	-----do-----	-----do-----	-----do-----	-----do-----	10	1032	55	17	6178	378	69
3	Hot HNO ₃ for 3 hrs.	0.5	-----do-----	P. E. (no model given)	1	992	73	15	6980	374	63
3	-----do-----	0.5	-----do-----	-----do-----	1	1029	72	15	6877	374	64
9	HNO ₃ , boil 1/2 hr., then boil to near dryness. Dilute 10 ml.	1.	-----do-----	P. E. 303	1	930	75	12.5	7200	330	72
9	-----do-----	1.	-----do-----	-----do-----	1	880	70	12.5	6300	330	75
148	Boiling HNO ₃	1.	-----do-----	-----do-----	1	1142	79	13	6172	338	65
148	-----do-----	1.	-----do-----	-----do-----	1	1054	68	14	6247	317	63
150	Nitric acid digestion.	2.	-----do-----	-----do-----	1	1250	88	18	7800	400	77
150	-----do-----	2.	-----do-----	-----do-----	1	1250	96	19	7500	400	73
120	Heat with conc. HNO ₃ , dilute.	1.	-----do-----	P. E. 403	1	740	63	8	2700	300	23
120	-----do-----	1.	-----do-----	-----do-----	1	770	61	9	2700	310	27
115	Nitric acid digestion.	4.	-----do-----	P. E. 103	1	1050	65	19	6900	331	62
115	-----do-----	4.	-----do-----	-----do-----	1	1050	70	10	7000	350	60
144	Heated in conc. HNO ₃ in boiling water bath.	0.5	-----do-----	Jarrell-Ash 82-270	1	900	70	10	5000	300	65
144	-----do-----	0.5	-----do-----	-----do-----	1	875	65	10	5000	325	65

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Concentrated nitric acid digestion--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
39	670	564	146	68	45	108	742	773	30	54	22	97	36	21	43	40	77	30
39	667	494	140	68	43	109	742	680	31	54	21	97	36	19	41	41	69	31
3	793	568	228	80	55	132	591	773	44	57	21	116	37	21.3	60.6	44.1	81.8	30.2
3	821	563	215	75	60	136	603	751	41	67	27	116	36.2	21.1	61.1	44.0	81.0	30.7
9	630	480	150	67.5	32.5	130	520	630	25	42.5	20	93	32.5	15	42.5	40	70	27.5
9	630	480	150	57.5	35	87	480	560	20	42.5	25	95	27.5	17.5	47.5	40	70	25
143	862	623	244	77.5	50.5	113	624	662	25	35	23	102	24	21	46	43	73	25
148	802	615	248	77.5	51	107	615	643	27	38	22	97	30	18	45	44	73	21
150	710	675	179	83	53	70	700	1000	42	65	35	125	34	18	52	55	78	30
150	700	690	185	76	54	75	675	1000	45	65	30	123	33	18	52	45	80	26
120	570	450	150	64	38	81	690	700	38	47	16	90	--	--	--	--	--	--
120	530	450	150	67	42	97	670	730	41	57	28	110	--	--	--	--	--	--
115	--	--	--	--	--	--	610	640	20	50	20	90	--	--	--	--	--	--
115	--	--	--	--	--	--	650	680	25	40	30	110	--	--	--	--	--	--
144	475	400	120	55	35	80	575	675	20	30	20	100	25	15	40	40	75	30
144	475	375	120	50	30	80	600	675	20	30	30	100	25	15	40	40	70	25

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Concentrated nitric acid digestion--Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
173	5 ml conc. HNO ₃ , stand cold 15 min., bring to boil 15 min. stir; dilute to 23 ml with H ₂ O, heat 15 min., dilute to 25 ml.	0.5	---do-----	Jarrell-Ash 82-500	1	900	85	11	5812	300	54
173	Analyst A	0.5	---do-----	---do-----	1	950	74	15	6250	320	65
173	Analyst B	0.2	---do-----	---do-----	2	1045	72	12	6700	357	65
173	---do-----	0.2	---do-----	---do-----	2	1127	70	18	5750	400	67
173	Analyst C	0.5	---do-----	---do-----	4	1000	76	14	6250	339	66
173	---do-----	0.5	---do-----	---do-----	4	990	79	15	6050	340	71
216	Boil 30 min., conc. HNO ₃ . Final soln. 1+1 HNO ₃ .	0.1	---do-----	Jarrell-Ash m.v.	1	1150	76	14	7100	365	68
216	---do-----	0.1	---do-----	---do-----	1	1280	72	14	6700	320	74
61	5 ml HNO ₃ heat on sand bath 30 min. + 5 ml H ₂ O boil.	0.25	---do-----	EEL 140	1	990	81	15	6444	371	63
61	---do-----	0.25	---do-----	---do-----	1	1072	81	16	6444	359	63
104	HNO ₃ attack	0.5	---do-----	Tech. AA4	1	1110	50	23	7000	390	83
104	---do-----	0.5	---do-----	---do-----	1	1050	50	26	7000	435	57
1	Hot HNO ₃ leach	---	-----	P. E. 303	1	---	100	--	---	---	---
1	---do-----	---	-----	---do-----	1	---	---	--	7400	---	---
248	HNO ₃ @ 300-350°C for 30 min.	0.5	-----	V. T. 5	1	1320	76	12	5450	370	65
248	---do-----	0.5	-----	---do-----	1	1340	83	12	5330	355	62

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Concentrated nitric acid digestion--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
173	625	500	174	70	43	101	655	757	75	67	27	112	44	23	55	42	70	24
173	600	500	168	75	44	106	660	700	64	70	26	112	41	22	66	50	76	35
173	645	537	173	77	44	98	697	750	102	75	34	129	36	22	64	49	72	27
173	765	551	179	65	40	120	663	715	148	75	51	148	31	19	68	32	155	37
173	705	545	174	73	47	105	615	682	24	53	18	103	35	19	57	44	79	30
173	675	555	170	80	46	115	615	710	25	50	18	107	35	21	56	64	79	31
216	760	550	170	75	44	100	--	--	--	--	--	--	34	20	51	33	68	29
216	750	520	155	71	42	120	--	--	--	--	--	--	35	18	50	32	72	31
61	670	537	193	75	44	99	559	753	30	68	12	93	33	21	59	31	72	26
61	655	533	178	74	43	99	610	744	34	69	12	90	33	18	66	39	76	25
104	710	490	203	77	47	115	725	675	20	70	20	100	68	18	73	45	92	36
104	705	725	213	110	55	122	675	625	20	50	50	125	52	18	70	36	68	30
1	---	600	---	---	---	---	---	---	---	---	---	---	---	52	---	---	---	---
1	---	---	---	80	---	---	---	---	---	---	---	---	---	---	---	30	---	---
248	700	519	169	71	46	104	664	672	24	42	37	102	37	17	50	40	72	25
248	687	538	170	71	45	104	652	720	18	32	22	112	36	18	51	40	68	24

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Concentrated nitric acid digestion--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
173	--	--	--	--	--	--	--	--	--	--	--	--
173	--	--	--	--	--	--	--	--	--	--	--	--
173	--	--	--	--	--	--	--	--	--	--	--	--
173	19	10	40	20	33	21	--	--	--	--	--	--
173	20	10	41	33	33	20	--	--	--	--	--	--
216	17	11	46	17	37	24	--	--	--	--	--	--
216	18	11	42	16	33	22	--	--	--	--	--	--
61	16	13	53	19	35	19	--	--	--	--	--	--
61	20	12	50	22	33	23	--	--	--	--	--	--
104	25	18	60	18	30	18	--	--	--	--	--	--
104	25	16	63	25	30	25	--	--	--	--	--	--
1	--	36	--	--	--	--	--	--	--	--	--	--
1	--	--	--	44	--	--	--	--	--	--	--	--
248	13	9	43	16	32	16	37.9	17.5	2.9	5.8	1.8	1.7
248	13	10	45	16	30	16	21.8	11.6	3.0	5.7	1.7	1.7

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Dilute nitric acid digestion

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
31	20% HNO ₃ in water bath 95°C for 1.5 hrs.	0.5	None	Tech. AA 5	1	840	68	9	6550	330	48
31	---do-----	0.5	---do-----	---do-----	1	835	68	9	6600	330	48
53	Boil with 7N HNO ₃ for 3 hrs.	1.	---do-----	P. E. 303	4	1065	77	18	5303	326	66
53	---do-----	1.	---do-----	---do-----	4	1065	76	16	5462	325	65
123	1+1 H ₂ O+HNO ₃ heat 1 hr. dilute to 30 ml.	3.	---do-----	---do-----	1	1100	80	--	7000	400	60
123	---do-----	3.	---do-----	---do-----	1	1050	80	--	6300	370	60
157	Heat with 2.5N HNO ₃ 60 min.	0.5	---do-----	---do-----	1	820	72	10	6100	340	30
157	---do-----	0.5	---do-----	---do-----	1	800	78	11	5700	347	31
2	10% HNO ₃ boil 1 hr.	0.5	---do-----	Jarrell-Ash 82-800	1	882	72	12	6120	338	51
2	---do-----	0.5	---do-----	---do-----	1	939	73	11	6080	344	51
146	Heat with 25% HNO ₃ at 100°C for 1 hr.	1.	---do-----	Jarrell-Ash m.v.	1	800	63	7	6000	330	40
146	---do-----	1.	---do-----	---do-----		780	63	8	6000	320	48
122	Heat with 25% HNO ₃ @150°C	1.	---do-----	Jarrell-Ash		1080	75	10	7000	370	50
122	---do-----	1.	---do-----	---do-----		1100	70	10	6900	360	50
19	4N HCl solution	0.2	---do-----	Tech. AA 4		--	--	--	--	--	--
19	---do-----	0.2	---do-----	---do-----		--	--	--	--	--	--

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Dilute nitric acid digestion--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
31	485	475	135	69	42	86	590	690	26	53	22	96	--	--	--	--	--	--
31	425	475	135	68	41	86	580	690	26	53	22	95	--	--	--	--	--	--
53	748	546	212	77	47	113	668	719	33	58	25	111	43	24	80	47	85	37
53	749	553	213	78	49	114	671	710	33	58	14	111	46	26	77	46	87	37
123	650	550	--	70	45	95	700	750	--	25	30	30	30	20	--	45	80	30
123	650	540	--	75	45	95	650	800	--	30	20	98	30	20	--	50	75	30
157	350	520	145	65	37	70	430	730	8	83	15	100	--	--	--	--	--	--
157	350	510	160	68	39	75	430	780	8	76	14	95	--	--	--	--	--	--
2	439	458	131	70	44	86	500	677	2	34	7	82	14	14	28	34	67	17
2	487	473	143	68	41	86	544	701	1	35	6	75	15	15	29	34	68	17
145	250	330	60	35	20	47	350	500	17	28	16	60	16	13	42	28	50	19
146	270	380	55	28	17	37	400	600	20	28	15	62	20	13	40	30	50	19
122	475	550	150	65	40	100	550	700	35	40	25	80	--	--	--	--	--	--
122	500	500	140	70	40	85	560	690	35	40	25	85	--	--	--	--	--	--
19	--	--	--	--	--	--	--	--	--	--	--	--	20	16	39	35	58	22
19	--	--	--	--	--	--	--	--	--	--	--	--	19	16	36	36	66	24

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Dilute nitric acid digestion--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
31	--	--	--	--	--	--	9.0	15	1.5	3.5	1.3	1.3
31	--	--	--	--	--	--	9.5	15	1.5	3.5	1.3	1.3
53	--	--	--	--	--	--	--	--	--	--	--	--
53	--	--	--	--	--	--	--	--	--	--	--	--
123	15	15	--	20	40	20	--	--	--	--	--	--
123	15	15	--	20	40	20	--	--	--	--	--	--
157	--	--	--	--	--	--	--	--	--	--	--	--
157	--	--	--	--	--	--	--	--	--	--	--	--
2	2	5	13	11	27	11	--	--	--	--	--	--
2	2	4	15	12	25	9	--	--	--	--	--	--
146	15	12	30	18	28	17	5	6	2	4.5	3.5	2.5
145	15	12	30	20	26	16	4	5.5	2.5	4	3.5	2
122	--	--	--	--	--	--	--	--	--	--	--	--
122	--	--	--	--	--	--	--	--	--	--	--	--
19	7	6	27	14	26	13	2.9	5.7	2.7	3.4	1.4	1.2
19	9	7	25	12	29	13	2.6	6.0	2.4	3.5	1.5	1.4

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Digestion with HClO₄

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
102	HCl ₄ (70%) at 180°C for 2 hrs. Dilute H ₂ O.	0.2	None	V., Tech. AA 5	1	1160	70	20	5200	270	65
102	---do-----	0.2	---do-----	---do-----	1	1140	80	35	5500	270	65
129	HClO ₄ (70%) 20 min. at 180°C. Dilute CH ₂ O. (with)	0.2	---do-----	V. Tech. AA 120	2	1200	50	<50	6550	375	50
129	---do-----	0.2	---do-----	---do-----	2	1200	100	<50	6450	400	75
154	Digestion with HClO ₄ (70%) 4 hrs.	0.2	---do-----	P. E. 303	1	--	80	23	--	--	68
154	---do-----	0.2	---do-----	---do-----	1	--	80	24	--	--	70
93	HClO ₄ for 2 hrs. at 180°C. Dilute H ₂ O.	0.5	---do-----	Tech. AA 4	2	1100	70	10	6750	315	57
93	---do-----	0.5	---do-----	---do-----	2	1175	70	10	6650	305	60
140	HClO ₄ 2 hrs. at 200°C. Dilute H ₂ O.	0.1	---do-----	---do-----	1	1150	85	20	6750	385	75
140	---do-----	0.1	---do-----	---do-----	1	1150	70	10	6000	370	65
28	HClO ₄ digestion	0.25	---do-----	Unicom SP 90	4+	1150	80	13	6530	315	71
28	---do-----	0.25	---do-----	---do-----	4+	1150	78	15	6560	330	68
36	HClO ₄ boil 4.5 hrs.	0.25	---do-----	Tech. AA 5	1	960	80	16	6100	380	74
36	---do-----	0.25	---do-----	---do-----	1	1150	85	16	6150	390	73
141	Digest 2 hrs. with HClO ₄ @ 185°C	0.2	-----	Tech. 5	2-5	1200	81	22	6600	350	70

10

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Digestion with HClO_4 --Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
102	840	445	170	70	45	100	640	580	70	60	35	100	35	15	55	35	55	20
102	860	445	180	75	40	110	660	580	75	60	35	115	35	20	60	35	55	25
129	--	--	--	--	--	--	--	--	--	--	--	--	<50	<50	50	<50	50	<50
129	--	--	--	--	--	--	--	--	--	--	--	--	<50	<50	<50	<50	50	<50
154	--	--	--	70	40	--	--	--	21	40	22	--	--	--	--	--	--	--
154	--	--	--	70	40	--	--	--	20	40	28	--	--	--	--	--	--	--
93	825	560	200	70	45	115	850	770	45	57	30	107	41	21	56	42	72	28
93	850	550	200	70	45	110	865	775	40	60	32	100	42	21	60	42	67	28
140	850	600	200	70	50	120	850	700	44	60	40	110	45	20	65	50	85	30
140	800	550	210	70	50	120	850	700	40	60	30	110	45	20	65	45	80	30
28	910	670	216	69	42	112	800	730	66	60	33	105	57	35	86	46	68	45
23	800	640	219	78	44	110	755	730	66	60	34	104	51	34	86	48	74	42
36	680	540	215	86	51	125	709	727	42	58	31	135	41	22	64	43	73	32
36	760	560	210	80	54	120	763	714	44	58	32	130	43	22	62	43	77	30
141	790	550	230	94	58	130	790	730	20	42	15	101	48	25	73	49	80	36

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

HNO₃+HCl digestion

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
5	HCl+HNO ₃ →dry. Dilute HCl, filter.	10.	None	Tech AA-5	1	1000	79	16	6200	350	62
5	---do-----	10.	---do-----	---do-----	1	1000	78	16	6100	350	62
118	HCl+HNO ₃ →dry. 10% HCl final soln.	1.	---do-----	---do-----	1	1080	80	25	6500	360	75
118	---do-----	1.	---do-----	---do-----	1	1080	88	24	6450	350	72
18	Hot HCl+HNO ₃ extraction.	0.3	---do-----	Tech AA-4	1	1120	78	18	6250	355	69
18	---do-----	0.3	---do-----	---do-----	1	1135	78	18	6200	370	66
19	HNO ₃ +HCl digestion. Diluted with water.	1.	---do-----	---do-----	1	1104	81	5	6700	359	70
19	---do-----	1.	---do-----	---do-----	1	1113	80	5	6625	365	68
17	Hot HCl+HNO ₃ extraction.	0.25	---do-----	Jarrel Ash 810	1	1240	81	--	----	368	69
17	---do-----	0.25	---do-----	---do-----	1	1150	81	--	----	366	70
48	HCl+HNO ₃	1. <u>1</u>	---do-----	Beckman 979	1	1040	85	11	6340	380	70
48	---do-----	1. <u>1</u>	---do-----	---do-----	1	1060	86	11	6420	400	70
152 ^{2/}	HCl+HNO ₃ →dry. HCl	1.	2000 ppm Fe to	V. Tech. AA-5	2	1060	67	16	6360	307	59
	dry. HCl+NH ₄ acetate 25ml.		compensate Fe content of sample								
152 ^{2/}	---do-----	1.	---do-----	---do-----	2	1070	68	15	6360	303	58
152 ^{2/}	---do-----	1.	---do-----	---do-----	2	1070	65	14	6360	307	59
152 ^{2/}	---do-----	1.	---do-----	---do-----	2	1090	64	13	6385	315	52
152 ^{2/}	---do-----	1.	---do-----	---do-----	2	1100	65	14	6375	310	53
152 ^{2/}	---do-----	1.	---do-----	---do-----	2	1090	62	14	6375	305	54

13

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

HNO₃+HCl digestion--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
5	700	540	190	66	42	105	630	690	28	48	20	100	50	23	62	43	75	30
5	700	550	190	65	42	105	650	700	28	50	20	96	50	23	63	44	75	31
119	860	520	212	75	56	140	770	660	40	62	28	114	53	30	69	58	89	40
118	860	580	218	80	54	130	770	710	40	60	27	115	50	32	70	54	89	39
12	745	520	240	68	44	135	700	710	16	46	15	103	32	15	49	33	56	22
18	775	520	250	72	46	135	725	650	18	45	15	95	37	15	48	38	62	20
19	775	518	225	78	60	120	783	705	50	75	30	90	--	--	--	--	--	--
19	775	535	210	75	55	125	776	703	40	70	30	100	--	--	--	--	--	--
17	805	630	---	80	59	109	770	780	--	67	36	112	40	22	--	47	77	--
17	818	610	---	79	51	112	780	800	---	70	34	111	38	22	--	46	78	--
43	750	553	231	72	46	122	424	712	23	44	16	86	--	--	--	--	--	--
48	782	577	223	77	43	129	427	732	23	49	20	85	--	--	--	--	--	--
152	707	525	187	67	41	112	697	642	27	49	17	99	41	22	59	43	71	33
152	715	495	188	68	43	110	700	635	28	47	18	100	41	22	60	41	71	32
152	705	510	173	64	41	106	705	635	27	48	18	99	41	21	58	42	73	31
152	710	510	185	64	41	105	697	627	28	47	18	101	41	22	60	41	69	32
152	717	515	190	66	40	112	690	630	27	50	17	96	42	24	60	43	70	33
152	717	520	187	66	41	114	692	630	26	49	17	100	42	24	59	44	70	34

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

HNO₃+HCl digestion--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
5	22	13	63	22	36	25	28	18	1.7	3.8	1.4	1.1
5	22	14	63	22	37	25	28	18	1.8	3.8	1.4	1.0
118	--	--	--	--	--	--	34	17	3	5	2	2
118	--	--	--	--	--	--	34	19	3	5	2	2
18	15	10	52	16	28	16	--	--	--	--	--	--
18	15	10	52	16	28	16	--	--	--	--	--	--
15 19	--	--	--	--	--	--	--	--	--	--	--	--
19	--	--	--	--	--	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--	--	--	--	--	--
48	--	--	--	--	--	--	21	17	<0.5	3.1	0.83	<0.5
48	--	--	--	--	--	--	20	18	<0.5	3.5	0.88	<0.5
152	15	17	53	22	39	28	32.5	19	2.5	4.5	1.4	1.3
152	16	17	53	22	38	29	32.7 ^{3/}	17.7	2.5	4.4	1.3	1.3
152	16	18	52	21	40	29	32.2	18	2.5	4.5	1.4	1.4
152	16	17	53	22	39	28	32.5	19	2.5	4.4	1.3	1.4
152	15	18	51	21	37	28	32.5	17.5	2.5	4.5	1.3	1.4
152	14	18	50	22	37	30	33	17.7	2.5	4.5	1.3	1.3

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

HNO₃+HCl digestion--Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
42	HCl digest-HCl+HNO ₃ digest to dryness. Dilute HCl.	2.	-----	Tech. AA-5	1	990	78	14	6500	310	64
42	---do-----	2.	-----	---do-----	1	1000	76	14	6500	308	64
200	1-1/2ml HNO ₃ , 30 min. 95°C, 1/2ml HCl, 150 min. 95°C.	0.5	125 ppm Al ⁺⁺⁺ as AlCl ₃ in 10ml, dilute acid.	---do-----	1	1040	80	14	6950	370	67
200	---do-----	0.5	---do-----	P. E. 303	1	1060	79	15	6950	375	68
9	Aqua regia, boil 30 min. covered, boil to near dryness.	1.	Take up in dil. HNO ₃	---do-----	1	1000	83	15	6600	300	80
15 9	---do-----	1.	---do-----	---do-----	1	930	83	15	6300	310	78
88	HCl-HNO ₃ to dryness. HNO ₃ to dryness, 5% HNO ₃ .	1.	---do-----	Jarrell-Ash 240	1	1130	78	15	6580	320	72
88	---do-----	1.	---do-----	---do-----	1	1190	72	20	6700	325	75
28-2	1.5ml HNO ₃ +1.5ml, HCl+ 1ml H ₂ O, dilute H ₂ O.	1.	-----	P. E. 303	1	1221	75	15	7429	369	64
28-2	---do-----	1.	-----	---do-----	1	1003	78	16	7232	311	64
98	Aqua regia	1.	---do-----	Tech. AA-5	1	1150	80	--	6600	375	70
98	---do-----	1.	---do-----	---do-----	1	1150	80	--	6600	360	70
110	5ml aqua regia, water bath, dilute H ₂ O.	0.7	---do-----	---do-----	1	1230	75	16	7230	350	70
110	---do-----	0.7	---do-----	---do-----	1	1110	80	16	7170	360	70
109	Aqua regia	2.	---do-----	P. E. 303	1	932	77	13	6645	366	61
109	---do-----	2.	---do-----	---do-----	1	898	75	13	6675	342	60
150	---do-----Acalyst-I	1.	---do-----	---do-----	1	1105	85	25	6500	370	75

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

HNO₃+HCl digestion--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
42	752	552	188	74	46	124	675	695	54	64	30	118	50	22	70	46	75	31
42	762	540	175	73	46	124	675	690	54	62	30	119	50	22	70	45	73	31
200	730	550	200	69	45	107	665	705	38	51	24	100	41	19	64	43	77	28
200	740	550	200	70	46	109	675	705	37	51	24	101	41	20	63	43	76	29
9	730	500	190	65	35	110	640	590	27.5	47.5	20	105	47.5	17.5	55	37.5	75	25
9	660	480	190	65	37.5	120	580	630	30	45	20	95	37.5	17.5	62.5	35	70	27.5
88	790	520	220	73	39	130	775	715	32	50	15	108	--	--	--	--	--	--
68	795	510	215	68	42	130	765	690	30	48	10	105	--	--	--	--	--	--
28-2	978	660	270	83	48	135	780	728	25	67	18	98	--	--	--	--	--	--
25-2	951	671	247	80	48	143	707	711	32	48	24	93	--	--	--	--	--	--
93	--	560	--	--	--	120	--	--	--	--	--	--	--	--	--	--	--	--
98	--	565	--	--	--	120	--	--	--	--	--	--	--	--	--	--	--	--
110	830	530	190	70	45	120	760	680	31	55	21	105	44	18	60	42	70	24
110	770	560	195	70	46	115	690	720	31	55	21	105	39	19	60	42	75	26
109	494	461	165	63	41	83	850	600	5	23	8	35	31	22	60	38	77	30
109	476	443	160	63	39	85	1100	500	<5	24	<5	34	25	24	58	45	47	20
150	890	590	250	80	50	130	780	735	20	45	20	75	--	--	--	--	--	--
150	830	620	240	75	50	130	690	735	25	45	15	80	--	--	--	--	--	--

17

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

HNO₃+HCl digestion--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
42	33	15	64	22	34	25	31	13	5.6	3.4	0.7	0.2
42	35	14	64	22	34	25	31.5	14	3.4	3.1	0.2	0.2
200	23	12	63	18	35	21	29.4	16	2.6	4.8	1.8	1.5
200	22	13	61	19	35	21	29.5	17	2.7	4.7	1.8	1.6
9	15	12.5	55	17.5	25	17.5	35	7.5	2.5	5.0	2.0	1.7
9	15	<12.5	52.5	15	27.5	17.5	32.5	12.5	2.5	5.0	2.0	2.0
88	--	--	--	--	--	--	35	20	2.0	4.0	1.4	1.4
89	--	--	--	--	--	--	32	20	2.0	4.0	1.5	1.4
28-2	--	--	--	--	--	--	34	20	2	4	1	1
26-2	--	--	--	--	--	--	34	21	3	5	1	2
98	--	--	--	--	--	--	--	--	--	--	--	--
98	--	--	--	--	--	--	--	--	--	--	--	--
110	16	11	50	18	32	18	37	19	<2	4	<2	<2
110	16	12	55	18	34	18	35	21	<2	4	<2	<2
109	8	11	39	14	31	17	--	--	--	--	--	--
109	13	11	41	15	31	19	--	--	--	--	--	--
150	--	--	--	--	--	--	29	18	1.4	3.9	1.3	0.9
150	--	--	--	--	--	--	28	19	1.5	3.8	0.8	0.7

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]
 HNO₃+HCl digestion--Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
150	Aqua regia Analyst II	1.	---do-----	Evans Electro selenium	1	1350	50	5	8000	375	50
150	---do-----	1.	---do-----	Ltd (EEL)	1	1350	50	5	8000	375	50
29-1	---do-----	2.5	---do-----	P. E. 303	1	1170	75	16	6630	322	60
28-1	---do-----	2.5	---do-----	---do-----	1	1128	72	16	6737	334	58
23	---do-----	0.5	---do-----	Tech. AA-4	1	1040	79	13	6950	385	67
23	---do-----	0.5	---do-----	---do-----	1	1040	79	13	6950	385	65
27	---do-----	0.5	---do-----	---do-----	1	1190	72	14	6850	355	62
27	---do-----	0.5	---do-----	---do-----	1	1180	62	14	6800	370	61
134	---do-----	0.5	---do-----	Tech. AA-100	1	1050	110	35	7440	440	80
134	---do-----	0.5	---do-----	---do-----	1	1020	100	20	7680	470	70
38	---do-----	1.	---do-----	P. E. 290B	1	940	75	20	5000	320	65
38	---do-----	1.	---do-----	---do-----	1	960	70	20	5000	310	65
146	---do-----	1.	---do-----	Jarrel Ash	1	1050	80	15	8300	480	62
146	---do-----	1.	---do-----	Maximum Versatility	1	980	73	7	8500	470	56
56	---do-----	0.25	---do-----	Instru. Lab. Model 153	1	1155	72	14	6450	340	52
56	---do-----	0.25	---do-----	---do-----	1	1135	68	14	6400	350	55
204	HNO ₃ -HCl @ 90°C until dry; dissolve in HNO ₃ ; filter and dilute	2.	-----	P. E. 305	1	1180	69	21	6300	340	66
205	Digest with HNO ₃ +HCl; dilute to 10 ml & 1.2N HCl	0.5	Add matrix soln. containing Fe, La, Mg, Li, and Al	P. E. 403	3-43	918	--	--	6352	354	--
205	---do-----	0.5	---do-----	---do-----	3-43	---	--	--	---	---	--

19

1/ 5g used for Pb and Mg
 2/ Lab 152 analyzed 3 pairs of samples (6 samples X 2) X 3
 3/ Lab 152: 10 mg KCN added to digestion for silver

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

HNO₃+HCl digestion--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
150	750	650	275	75	25	140	550	700	25	45	15	75	38	24	62	34	76	34
150	750	650	275	75	25	140	550	700	20	40	15	80	38	24	62	30	72	30
26-1	789	534	202	67	40	114	--	--	--	--	--	--	42	33	70	43	65	33
28-1	775	569	208	67	42	114	--	--	--	--	--	--	41	29	73	45	68	32
23	730	560	191	69	45	102	660	730	38	51	21	96	39	20	58	43	75	27
23	730	560	192	69	45	105	660	730	38	51	21	95	39	20	58	43	74	27
27	825	560	165	72	42	111	810	690	31	49	20	115	44	19	56	38	65	24
27	825	553	165	71	41	108	790	630	29	48	20	120	44	17	56	38	67	24
134	--	--	--	--	--	--	530	650	80	80	50	100	--	--	--	--	--	--
134	--	--	--	--	--	--	530	650	80	80	50	100	--	--	--	--	--	--
38	900	535	390	110	95	205	700	800	<100	<100	<100	100	--	--	--	--	--	--
38	930	540	390	130	85	190	700	800	<100	<100	<100	100	--	--	--	--	--	--
20 146	600	620	83	52	30	72	750	800	33	40	16	85	100	35	120	50	80	33
146	600	620	84	55	30	72	650	850	55	50	25	85	100	40	120	55	80	40
56	785	545	195	70	45	120	715	685	20(?)	45	13	90	50	23	72	48	87	31
55	750	540	190	70	47	120	750	670	17(?)	44	15	94	53	21	75	44	82	30
204	793	491	218	75	53	120	724	640	46	56	22	114	60	25	83	47	80	41
205	738	--	--	66	46	--	707	--	--	21	10	--	--	--	--	--	--	--
205	--	--	--	--	--	--	--	--	--	--	63	--	--	--	--	--	--	--

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

HNO₃+HClO₄ digestion

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
125	HNO ₃ +HClO ₄ , heat, evap. HNO ₃ soln. 1% HClO ₄ .	0.5	None	Tech. AA 5	2	1070	74	15	6390	367	61
125	---do-----	0.5	---do-----	---do-----	2	1115	77	14	7060	389	67
171	3+1 HNO ₃ +HClO ₄ , evap. on hot air bath, repeated, HCl.	0.3	Fe, Al, Mg Spike of Standards	---do-----	2	1275	88	11	8550	426	78
22 171	---do-----	0.3	---do-----	---do-----	2	1440	81	12	8800	416	73
6	3+2 HNO ₃ +HClO ₄ at 150- 200°C evap. to moist, diluted with H ₂ O and filtered.	1.	---do-----	P. E. 303	3	910	54	9	4880	277	44
6	---do-----	1.	---do-----	---do-----	3	819	56	9	4800	265	46
6	---do-----	1.	---do-----	---do-----	3	1075	69	14	6020	320	64
6	---do-----	1.	---do-----	---do-----	3	960	73	14	6105	326	65
10	15+85 HNO ₃ +HClO ₄ , reflux HClO ₄ 3 hrs.	3.	---do-----	---do-----	1	1200	82	14	6700	350	72
10	---do-----	3.	---do-----	---do-----	1	1200	74	15	6600	380	73

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

HNO₃+HClO₄ digestion--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
125	646	522	174	70	43	98	631	741	25	22	21	100	32	19	53	40	75	25
125	666	538	158	72	44	105	636	696	21	25	22	103	33	19	47	42	77	23
171	745	600	245	80	60	140	--	--	--	--	--	--	32	25	57	44	87	45
171	780	535	255	76	54	250	--	--	--	--	--	--	42	21	55	43	80	23
6	615	404	153	58	37	93	630	586	12	15	16	76	35	16	45	31	55	22
5	557	420	149	56	35	98	523	575	14	16	17	78	32	16	45	30	53	22
6	724	460	196	60	41	105	733	713	28	39	30	113	49	23	76	41	68	33
6	665	509	196	75	49	110	731	739	29	41	28	118	49	22	76	43	69	32
10	800	530	270	78	48	110	810	660	23	45	25	130	49	21	68	48	78	32
10	760	520	260	81	51	110	750	670	26	44	19	130	48	18	71	49	84	31

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

HNO₃+HClO₄ digestion--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
125	20	11	47	18	34	19	33	15	3	5	2	2
125	13	11	37	18	35	20	33	15	3	4	2	2
171	5	4	44	10	29	10	--	--	--	--	--	--
171	10	10	50	17	35	15	--	--	--	--	--	--
6	11	10	31	13	26	14	2.5	1.0	1.3	1.4	1.1	0.9
6	10	10	31	14	25	14	3.5	1.1	1.2	1.9	0.9	0.9
6	16	11	47	19	34	25	29.3	10.0	4.0	4.6	2.0	2.2
6	16	12	49	21	36	24	24.3	6.2	2.5	4.5	2.1	1.9
10	55	20	83	26	44	36	39	20	4.1	5.5	1.8	2.7
10	58	19	84	26	45	34	38	18	4.0	5.5	2.1	2.6

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

HNO₃+HClO₄ digestion--Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
30	4+1 HNO ₃ +HClO ₄ , to dryness, 6M HCl dil. 1.5M HCl.	1.	---do---	---do---	1	1145	72	18	6090	335	62
30	---do---	1.	---do---	---do---	1	1135	72	16	5970	340	60
92	1+4 HNO ₃ +HClO ₄ for 1 hr. at 260°C.	0.2	---do---	P. E. 305	1	800	85	15	>5000	360	70
92	---do---	0.2	---do---	---do---	1	1050	80	15	>5000	370	70
154	4+5 HNO ₃ +HClO ₄ , heat slowly 40 min., fume 30 min.	1.	---do---	P. E. 303	1	1150	--	--	7120	360	--
25 154	---do---	1.	---do---	---do---	1	1070	--	--	6660	360	--
89	HNO ₃ /HClO ₄ , final 1M HCl.	0.25	---do---	P. E. 403	1	1194	79	16	6247	373	67
106	HNO ₃ /HClO ₄ , boil under reflux 3 hrs.	0.5	---do---	V. Tech. AA 4	1	1150	60	<20	6600	360	60
106	---do---	0.5	---do---	---do---	1	1200	100	<20	6600	360	60
137	HNO ₃ /HClO ₄ , heat 2 hrs., dil. to 100ml-C H ₂ O.	1.	---do---	---do---	5	1183	80	18	6800	360	72
137	---do---	1.	---do---	---do---	5	1192	77	18	6830	378	73
45	15+85 HNO ₃ +HClO ₄ , heat 3-4 hrs., dil. 10 ml C H ₂ O.	0.5	---do---	P. E. 290B	2	1180	86	16	7200	362	68
45	---do---	0.5	---do---	---do---	2	1180	80	16	7200	352	66
130	HNO ₃ -HClO ₄ digestion.	0.2	---do---	---do---	1	1100	80	15	6500	350	70
130	---do---	0.2	---do---	---do---	1	1050	80	15	6500	345	70

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

HNO₃+HClO₄ digestion--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
30	895	435	205	68	41	110	535	415	<5	20	<5	100	26	13	49	27	76	12
30	895	380	185	82	49	100	545	425	<5	30	<5	110	25	3	40	33	64	17
92	600	550	220	70	35	115	550	650	40	50	15	100	--	--	--	--	--	--
92	800	550	225	70	40	120	600	600	40	50	15	100	--	--	--	--	--	--
154	880	580	270	--	--	120	820	740	--	--	--	120	--	--	--	--	--	--
26 154	900	600	250	--	--	110	840	750	--	--	--	120	--	--	--	--	--	--
89	793	508	218	75	50	112	1112	921	57	66	35	145						
106	850	545	220	80	50	120	--	--	--	--	--	--	35	15	65	35	70	20
106	815	535	225	75	45	120	--	--	--	--	--	--	40	15	65	40	75	20
137	802	545	215	76	47	126	789	732	58	63	25	122	48	23	71	46	78	33
137	803	530	205	76	48	125	788	692	55	58	27	122	51	24	70	45	76	33
45	800	565	202	74	46	104	820	760	36	54	24	112	46	23	68	44	80	32
45	795	535	204	74	48	104	810	730	35	55	26	108	47	24	67	44	80	34
130	725	535	210	70	45	110	780	720	40	55	25	120	50	25	75	45	80	35
130	725	520	205	70	45	110	775	725	40	60	25	120	50	25	70	45	75	35

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]
 HNO₃+HClO₄ digestion--Continued

Lab. no.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1.	2	3	4	5	6
169	HNO ₃ -HClO ₄ evap. to dry. Leach with 5M HCl.	0.25	---do-----	Pye-U. SP90	3	1358	76	19	7465	400	62
169	---do-----	0.25	---do-----	---do-----	3	1375	81	19	7432	518	66
169	---do-----	0.25	---do-----	---do-----	3	1358	83	19	7300	432	71
169	(2d pair of samples)	0.25	---do-----	---do-----	3	1372	82	19	7300	417	65
190	3+1 HNO ₃ +HClO ₄ , fumed, dil. to 20 ml.	0.5	---do-----	Varian AA 6	1	1155	68	11	5800	299	47
190	---do-----	0.5	---do-----	---do-----	1	950	67	9	6650	301	61

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

HNO₃+HClO₄ digestion--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
169	920	550	266	74	50	110	907	683	53	61	29	111	107	35	138	65	96	53
169	910	593	253	76	52	114	967	740	53	62	32	110	109	39	138	69	97	55
169	910	600	250	70	50	112	960	773	62	60	34	115	110	40	140	63	99	56
169	903	577	255	75	48	110	940	750	62	64	31	112	113	41	143	71	98	55
150	540	459	174	76	41	93	610	648	20	18	15	89	39	14	52	43	73	21
190	469	457	168	69	40	105	532	649	19	12	16	99	34	16	55	40	71	23

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

HNO₃+HClO₄ digestion--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
169	49	18	91	26	42	27	--	--	--	--	--	--
169	52	18	91	26	40	26	--	--	--	--	--	--
169	51	21	92	24	42	30	--	--	--	--	--	--
169	48	17	87	25	42	26	--	--	--	--	--	--
190	12	6	38	14	28	10	13	<5	<5	<5	<5	<5
190	10	6	36	13	26	12	11	<5	<5	<5	<5	<5

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Digestions with HF plus various other acids

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
43	HNO ₃ -HClO ₄ -HCl-HF attack.	--	None	HF-HNO ₃ -HClO ₄ -HCl P. E. 303	1	1230	120	40	6530	410	110
43	---do---	--	---do---	---do---	1	1200	120	40	6600	410	100
95	Dissolution with HNO ₃ - HClO ₄ -HCl-HF.	1 or 2	---do---	P. E. 403	1	1180	--	--	6550	355	--
95	---do---	1 or 2	---do---	---do---	1	1180	--	--	6650	378	--
103	HNO ₃ -HClO ₄ -HCl-HF to dryness. Dissolve in HCl.	0.5	---do---	---do---	1	1200	76	17	6450	370	69
31 103	---do---	0.5	---do---	---do---	1	1200	78	16	6600	405	69
112	HNO ₃ -HClO ₄ -HCl-HF to dryness. Dissolve in 10% HCl.	1.	---do---	---do---	1	1230	88	32	6250	343	72
112	---do---	1.	---do---	---do---	1	1230	88	26	6250	347	72
142	HF-HNO ₃ -HCl to near dryness. HClO ₄ -HNO ₃ (4:1) to dryness, 10% HCl.	1.	---do---	P. E. 403 and V. Tech. AA 5	2	1120	76	22.5	6150	311	63
142	---do---	1.	---do---	---do---	2	1160	73	22.5	6200	308	63
142	---do---	1.	Standard additions	P. E. 403	1	1080	87	22	--	363	72
142	---do---	1.	---do---	---do---	1	1080	80	25	--	360	72

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
									HF-HNO ₃ -	HClO ₄ -	HCl							
43	--	--	--	--	--	--	820	820	31	48	22	88	--	--	--	--	--	--
43	--	--	--	--	--	--	780	780	27	48	22	88	--	--	--	--	--	--
95	770	544	215	71	52	117	792	715	48	55	25	105	--	--	--	--	--	--
95	770	520	215	71	53	117	785	685	50	55	25	105	--	--	--	--	--	--
103	1050	790	245	84	64	139	800	680	70	60	30	110	54	30	95	53	84	39
32																		
103	990	770	240	85	65	145	800	680	65	55	30	110	55	30	95	53	87	40
112	730	488	182	60	52	116	815	700	55	75	35	123	44	34	67	48	75	39
112	732	500	192	60	52	114	795	704	55	70	35	122	48	30	75	42	76	42
142	850	534	232	84	62	131	885	688	90	65	38	125	75	33	102	55	83	44
142	850	527	217	79	60	131	905	700	90	65	38	125	75	33	102	56	83	44
142	900	575	240	92.5	70	132	--	--	--	--	--	--	80	32.5	129	40	90	45
142	900	575	240	95	70	132	--	--	--	--	--	--	80	32.5	129	39	90	45

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
							HF-HNO ₃ -HClO ₄ -HCl					
43	--	--	--	--	--	--	--	--	--	--	--	--
43	--	--	--	--	--	--	--	--	--	--	--	--
95	--	--	--	--	--	--	--	--	--	--	--	--
95	--	--	--	--	--	--	--	--	--	--	--	--
103	30	30	93	32	54	43	29	16.3	2.9	4.0	1.5	1.3
103	30	30	94	32	55	41	28	16.0	2.9	4.0	1.6	1.5
112	33	16	80	51	80	25	<0.5	<0.5	3	1.5	1.7	32
112	38	16	79	51	80	25	<0.5	<0.5	3	1.5	1.7	32
142	43.9	20	82	28	40	30	--	--	--	--	--	--
142	43.9	20	82	23	35	29	--	--	--	--	--	--
142	44	19	97	34	65	50	--	--	--	--	--	--
142	43	20	97	34	65	50	--	--	--	--	--	--

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]
Digestions with HF plus various other acids--Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
HF-HNO ₃ -HClO ₄ -HCl--Continued											
15	HClO ₄ -HNO ₃ -HCl-HF near dryness. Soln. in 2.4 N HCl.	2.	None	E. L. 153	1	1166	81	17	6708	386	67
15	---do---	2.	---do---	---do---	1	1194	86	20	6541	367	69
15	---do---	1.	---do---	Tech AA-3	1	1140	83.5	19.5	6480	376	74
15	---do---	1.	---do---	---do---	1	1155	86	20	6340	368	73
106	HF-HNO ₃ to fumes twice, HClO ₄ to fumes, 1m HCl.	0.5	---do---	Tech AA-4	1	1150	80	<20	6800	380	80
106	---do---	0.5	---do---	---do---	1	1200	100	<20	6800	380	80
114	HF+HNO ₃ +HCl to decompose HClO ₄ added, evap. to dryness	---	---do---	Not given	1	1100	80	25	6200	320	65
114	---do---	---	---do---	---do---	1	1100	70	25	6000	400	65
71	HF+HNO ₃ +HClO ₄ to dry.; soln. in HCl; dilute	0.2	---	V. Tech. A.A. 100	1	1300	83	19	6990	362	74
71	---do---	0.2	---	---do---	1	1265	90	25	7025	360	78
HF+HCl+HNO ₃											
18	Decomposition with HF+HCl+HNO ₃ .	1.	None	Tech AA-4	1	1160	80	16	6400	355	71
18	---do---	1.	---do---	---do---	1	1160	80	17	6400	370	68
HF+HNO ₃ +HClO ₄											
171	HNO ₃ +HClO ₄ fumed away twice; then HF+HClO ₄ fumed away twice, taken up in 5M HCl	0.3	Stds. spiked with Fe, Al and Mg	V. Tech. AA-5	1	--	91	--	--	371	--

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	HF-HNO ₃ -HClO ₄ -HCl--Continued																	
15	841	563	220	79	64	124	803 ^{1/}	676	26	74	30	122	56	34	76	56	94	37
15	833	583	224	75	52	125	791	752	27	151	22	128	60	37	80	56	86	37
15	858	575	239	74	57	128	805	707	30	35	26	103	--	--	--	--	--	--
15	842	560	231	75	57	132	767	681	22	39	30	99	--	--	--	--	--	--
105	850	540	230	70	50	140	--	--	--	--	--	--	60	20	85	60	90	45
105	825	560	220	80	60	135	--	--	--	--	--	--	55	35	85	60	95	45
114	850	550	250	80	50	110	750	650	50	70	50	100	50	40	70	55	90	50
114	830	550	250	70	100	120	750	650	50	80	50	120	45	35	65	50	80	45
71	835	570	232	78	63	143	886	778	61	63	32	119	55	33	82	50	37	38
71	810	558	230	88	63	138	895	779	75	70	38	131	50	30	80	50	85	40
	HF+HCl+HNO ₃																	
18	825	540	260	74	56	160	850	675	20	37	21	110	35	16	49	37	68	19
18	825	565	255	76	66	165	850	725	25	45	19	100	36	17	49	37	72	24
	HF+HNO ₃ +HClO ₄																	
171	--	625	--	--	63	--	--	--	--	--	--	--	--	19	--	--	72	--
171	--	695	--	--	76	--	--	--	--	--	--	--	--	23	--	--	81	--

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
	HF-HNO ₃ -HClO ₄ -HCl--Continued											
15	17	25	58	30	51	29	--	--	--	--	--	--
15	21	29	62	32	43	30	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--
106	20	25	75	30	45	35	--	--	--	--	--	--
106	20	20	70	30	45	40	--	--	--	--	--	--
114	15	20	55	15	35	30	40	25	<5	5	<5	<5
36 114	15	15	50	15	35	30	40	25	<5	5	<5	<5
71	44	31	89	33	48	42	30	18	3	5	2	2
71	26	31	74	26	56	44	39.5	19	4	5	3	2
	HF+HCl+HNO ₃											
18	17	12	50	20	34	22	37	20	<5	5	<5	<5
18	18	12	49	16	35	22	36	20	<5	6	<5	<5
	HF+HNO ₃ +HClO ₄											
171	--	5	--	--	23	--	--	--	--	--	--	--
171	--	6	--	--	29	--	--	--	--	--	--	--

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
HF+HNO ₃ +HClO ₄ --Continued											
171	HF+HClO ₄ fumed away twice; then HNO ₃ +HClO ₄ fumed away twice, taken up in 5M HCl	0.3	-----do-----	-----do-----	1	--	87	--	--	385	--
171	-----do-----	0.3	-----do-----	-----do-----	1	--	88	--	--	388	--
56	(3+2 HNO ₃ +HClO ₄)+HF. Dry. HNO ₃ -HClO ₄ dry-HNO ₃ .	0.5	None	I. L. Model 153	1	1200	85	16	6850	365	71
56	-----do-----	0.5	-----do-----	-----do-----	1	1175	81	14	7000	375	71
22	HF+HNO ₃ +HClO ₄ to dryness. Dissolve in HNO ₃ +HClO ₄ .	1.	-----do-----	Tech AA-5	1	1170	81	15	6650	352	69
22	-----do-----	1.	-----do-----	-----do-----	1	1160	78	17	6550	344	69
11	HF-HClO ₄ dry. Dissolve 1+1 HNO ₃ .	0.5	-----do-----	P. E. 305	1	1200	83	16	6700	360	74
105	Dissolve in HF-HNO ₃ . HClO ₄ (dilute).	2.	-----do-----	P. E. 303	1	1032	71	36	5550	299	71
2	HF+HNO ₃ +HClO ₄ to dryness. Dissolve in 10% HNO ₃ .	1.	-----do-----	Jarrell-Ash 82-800	1	1160	80	16	6780	364	72
2	-----do-----	1.	-----do-----	-----do-----	1	1160	83	16	6800	364	72
76	HF+HNO ₃ +HClO ₄ to dryness. Dissolve in 1+2 HNO ₃ .	1.	-----do-----	Nippon-Jarrell-Ash AA-780	1	1250	87.5	17.5	6875	400	73.8
76	-----do-----	1.	-----do-----	-----do-----	1	1287.5	83.8	17.5	6800	425	73.8
43	HF/HNO ₃ /HClO ₄ attack	--	-----do-----	P. E. 303	1	--	--	--	--	--	--
43	-----do-----	--	-----do-----	-----do-----	1	--	--	--	--	--	--

37

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
	HF+HNO ₃ +HClO ₄ --Continued																	
171	--	585	--	--	64	--	--	--	--	--	--	--	--	21	--	--	75	--
171	--	590	--	--	66	--	--	--	--	--	--	--	--	26	--	--	79	--
56	845	575	220	81	55	135	765	730	8	35	19	102	52	23	71	46	79	31
56	800	535	215	80	56	135	755	730	8	37	17	102	48	20	70	47	83	28
22	825	560	215	75	54	129	825	720	13	51	18	97	38	20	49	36	66	24
22	810	530	215	74	54	136	820	715	14	59	25	106	33	22	52	37	65	22
11	810	570	240	72	56	145	810 ^{1/}	720	17	55	20	112	38	28	76	45	88	41
105	700	500	200	74	51	117	700	700	31	46	24	111	39	28	64	39	72	80
38 2	770	537	211	81	58	138	775	737	6	37	12	110	33	18	55	40	73	22
2	785	537	218	79	59	133	788	745	6	37	12	100	37	18	49	37	72	20
76	850	575	210	82.5	57.5	130	750	650	12.5	12.5	13	85	37.5	17.5	50	40	67.5	27.5
76	850	563	207.5	82.5	63	127.5	755	645	12.5	13	13	87.5	40	17.5	50	38.5	70	27.5
43	--	--	--	--	--	--	--	--	--	--	--	--	108	92	108	130	130	114
43	--	--	--	--	--	--	--	--	--	--	--	--	114	92	114	130	130	114

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
							HF+HNO ₃ HClO ₄ --Continued					
171	--	5	--	--	27	--	--	--	--	--	--	--
171	--	5	--	--	30	--	--	--	--	--	--	--
56	7	7	26	13	27	10	--	--	--	--	--	--
56	8	5	23	13	27	10	--	--	--	--	--	--
22	4	5	45	10	29	10	34.0	18.5	<0.5	4.0	1.0	<0.5
22	6	7	45	13	27	11	32.5	17.5	0.5	4.5	1.5	0.5
11	11	12	43	15	25	16	--	--	--	--	--	--
105	--	--	--	--	--	--	30	18	2	5	2	2
39 2	5	8	35	17	32	15	--	--	--	--	--	--
2	5	9	34	15	34	12	--	--	--	--	--	--
76	15	13.8	37.5	20	35	25	--	--	--	--	--	--
76	13.8	14	38	20	36.3	23.8	--	--	--	--	--	--
43	--	--	--	--	--	--	19	18	2	5	2	2

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
HF+HNO ₃											
167	HF+HNO ₃ to dryness. Dissolve in dil. HCl.	1.	None	Tech-AA-4	1	1200	83	18	6380	354	76
167	---do-----	1.	---do-----	---do-----	1	1180	85	20	6380	347	76
174	Decomposition in HF+ HNO ₃ dilute with H ₂ O?	1.	Boric acid and 0.3 g/l K in final soln.	---do-----	1	1150	76.5	16.5	6650	340	62.5
174	---do-----	1	---do-----	---do-----	1	1125	72	18	6350	355	62.5
62	Dissolve in HNO ₃ +HF; evap. to dry, take up in HCl	1.	---do-----	---do-----	1	--	--	--	--	--	--
62	---do-----	1.	---do-----	---do-----	1	--	--	--	--	--	--
HF+HClO ₄											
171	HF+HClO ₄ fumed twice. HCl to dryness up in 5M HCl.	0.3	Stds. spiked with Fe, Al and Mg.	V. Tech. AA-5--	2	1270	91	20	7265	400	74
171	---do-----	0.3	---do-----	---do-----	2	1140	89	19	7200	406	79
100	Dissolve in HF+HClO ₄ then HCl(5:95).	1.	None	P. E. 303	1	1070	82	31	6325	387	72
100	---do-----	1.	---do-----	---do-----	1	--	88	27	6295	--	75
89	HF+HClO ₄ to dryness. HClO ₄ to dryness. 6MHCl to dilute.	0.3	---do-----	P. E. 403	1	1155	78	18	6000	375	68

04

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
HF+HNO ₃																		
167	809	511	249	54	51	115	1150	790	117	83	67	187	58	53	71	52	109	58
167	797	522	269	56	49	108	1200	805	135	40	73	156	60	50	73	50	109	61
174	780	537	210	70	47	113	--	--	--	--	--	--	32	17	48	40	67	26
174	755	425	210	52	40	110	--	--	--	--	--	--	31	14	47	35	66	22
62	--	--	--	--	--	--	--	690	--	--	--	80	--	--	--	--	--	--
62	--	--	--	--	--	--	--	620	--	--	--	80	--	--	--	--	--	--
HF+HClO ₄																		
171	875	630	270	87	65	170	--	--	--	--	--	--	29	13	52	39	77	21
171	800	635	270	85	65	175	--	--	--	--	--	--	29	21	52	43	81	23
100	905	654	193	61	69	144	819	656	<5	36	18	94	40	25	--	48	67	51
100	890	565	199	69	--	124	760	636	<5	39	--	91	41	--	76	52	--	44
89	740	465	175	64	43	107	1100	975	60	90	42.5	130	47	23	67	46	77	35
89	725	490	198	65	43	116	1050	1000	62.5	90	50	165	48	23	72	46	80	33

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
HF+HNO ₃												
167	30	63	64	27	88	66	--	--	--	--	--	--
167	32	62	68	30	88	67	--	--	--	--	--	--
174	8.5	9.5	38	16	27.5	15	--	--	--	--	--	--
174	8.5	7	36	14	27.5	12.5	--	--	--	--	--	--
62	--	--	--	--	--	--	--	--	--	--	--	--
62	--	--	--	--	--	--	--	--	--	--	--	--
HF+HClO ₄												
171	6	9	50	17	40	18	--	--	--	--	--	--
171	16	15	52	15	35	15	--	--	--	--	--	--
100	11	--	34	15	36	14	--	--	--	--	--	--
100	--	11	44	13	--	13	--	--	--	--	--	--
89	20	15	62.5	22.5	35	25	--	--	--	--	--	--
89	20	15	65	20	35	27.5	--	--	--	--	--	--

42

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
HF+HCl											
128	HF - dilute to 100 ml 1N HCl.	1.	5 g/l Na in 1N HCl	P. E. 403	1	1055	76	17	6115	356	66
128	---do-----	1.	Na in 1N HCl	---do-----	1	1085	72	23	6285	372	76
62	HF and dissolve in 1+1 HCl.	1.	None	Tech AA-5	1	1170	80	<10	6450	430	60
62	---do-----	1.	---do-----	---do-----	1	1050	70	<10	6400	370	60
91	Evap. with HF. Dissolve in HCl.	0.5	---do-----	---do-----	1	1220	140	120	6200	400	140
91	---do-----	0.5	---do-----	---do-----	1	1170	150	90	6200	400	160
HF-HCl-HNO ₃											
CF 114	HF-HCl-HNO ₃ at 3-5 atmos. and 120° for 20 min.	0.2	Sat boric acid added to soln.	P. E. 303	1	1300	--	87	7050	675	--
114	---do-----	0.2	---do-----	---do-----	1	1300	150	87	6900	--	--
114	HF-HCl-HNO ₃ . Fuse residue with Na ₂ CO ₃ , K ₂ CO ₃ & Na ₂ B ₄ O ₇ .	0.5	None	Not given	1	1200	100	<100	6400	400	<10
114	---do-----	0.5	---do-----	---do-----	1	1100	100	100	6500	400	<10
62	Dissolved in HF+HCl+HNO ₃ Evap. to dry, take up in HCl	10.	---do-----	---do-----	1	--	--	--	--	--	--
62	---do-----	10.	---do-----	---do-----	1	--	--	--	--	--	--

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
HF+HCl																		
128	797	572	227	73	53	118	835	772	45	110	105	189	28	15	52	41	65	15
128	813	510	236	77	54	121	840	692	56	135	112	212	31	12	53	39	70	17
62	800	540	260	80	60	150	--	--	--	--	--	--	40	40	60	50	90	50
62	740	500	250	80	60	130	--	--	--	--	--	--	40	30	70	50	90	40
91	830	470	220	80	100	150	1150	890	190	130	130	200	140	60	140	90	130	80
91	780	500	200	110	70	210	1090	900	120	140	100	210	110	80	120	90	130	60
HF-HCl-HNO ₃																		
114	770	595	260	80	90	210	650	800	140	100	60	60	75	75	100	110	120	75
114	--	--	--	--	--	--	1000	750	--	--	--	--	75	60	100	65	132	100
114	1000	800	300	300	200	300	800	800	--	--	--	--	60	80	100	80	160	100
114	900	700	300	200	200	300	800	700	--	--	--	--	60	80	100	60	160	80
62	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
52	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

1/ Average of 2 % determinations for each of the 6 samples.

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedures--Continued
 [All results are in parts per million (ppm)]

Digestions with HF plus various other acids--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
HF+HCl												
129	9	6	33	12	25	13	--	--	--	--	--	--
123	8	6	35	11	28	13	--	--	--	--	--	--
52	20	30	60	30	50	40	--	--	--	--	--	--
62	20	30	50	30	50	30	--	--	--	--	--	--
91	--	--	--	--	--	--	--	--	--	--	--	--
91	--	--	--	--	--	--	--	--	--	--	--	--
HF-HCl-H ₂ O ₂												
114	50	96	96	100	100	100	--	--	--	--	--	--
114	52	70	100	105	112	138	--	--	--	--	--	--
114	20	80	80	60	120	120	30	20	<10	<10	<10	<10
114	20	80	80	40	120	80	30	20	<10	<10	<10	<10
62							29	17	--	--	--	<1
62							27	16	--	--	--	<1

54

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedures--Continued
 [All results are in parts per million (ppm)]

Other digestions

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
HNO ₃ , HCl and HClO ₄											
13	HCl+H ₂ O(1+1) HNO ₃ , HClO ₄ , 1 1/2 hrs. at 185°C.	0.2	Standard solution was matrixed to components.	Tech. AA 5	3	1055	76	16	6070	348	52
13	---do-----	0.2	---do-----	---do-----	3	1075	77	16	6070	353	50
6N HCl											
113	Heat 1 hr. on hot water bath with 6N HCl. Dilute.	1.	None	Perkin-Elmer 306	2	1101	77	16.5	6890	384	71.5
113	---do-----	1.	---do-----	---do-----	2	1120	77	15.5	6800	387	71.5
120	Cold 6N HCl in vortex mixer 30 sec.	1.	---do-----	Perkin-Elmer 403	1	1000	63	10	7100	300	69
120	---do-----	1.	---do-----	---do-----	1	980	63	10	7200	310	83
HCl-HNO ₃ -KClO ₄											
97	HCl evap. to moist; HNO ₃ +KClO ₄ to moist; HCl solution.	2.	None	Varian Techtron AA 5	1	1100	90	15	6600	370	65
97	---do-----	2.	None	---do-----	1	1100	80	20	6700	360	70

94

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Other digestions--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
HNO ₃ , HCl and HClO ₄																		
13	765	510	215	91	55	122	710	660	31	47	18	101	34	19	52	38	71	28
13	780	525	220	82	55	118	720	665	32	46	19	98	35	18	52	37	70	26
6N HCl																		
113	798	560	212	81	50	124	718	807	34	55	25	112	39	19	62.5	37.5	77.5	26
113	812	562	204	85	48	123	743	801	36	54	23	113	40.5	20	60	38	77.5	24
120	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
120	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HCl-HNO ₃ -KClO ₄																		
97	--	--	--	--	--	--	740	690	35	55	20	90	50	25	65	45	75	30
97	--	--	--	--	--	--	730	680	35	50	20	95	50	25	65	45	70	30

47

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Other digestions--Continued

Lab. No.	Cobalt (ppm) in sample numbers						Silver (ppm) in sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
							HNO ₃ , HCl and HClO ₄					
13	12	9	48	15	36	14						
13	11	8	49	14	37	13						
							6N HCl					
113	--	--	--	--	--	--	--	--	--	--	--	--
113	--	--	--	--	--	--	--	--	--	--	--	--
120	--	--	--	--	--	--	--	--	--	--	--	--
120	--	--	--	--	--	--	--	--	--	--	--	--
							HCl-HNO ₃ -KClO ₄					
97	20	15	55	20	35	20	34	20	4	5	2	2
97	20	15	55	20	30	20	34	20	3	4	2	1

84

1

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Other digestions--Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicate	Copper (ppm) In sample numbers					
						1	2	3	4	5	6
Conc. HCl											
97	Digestion 1 hr. with conc. HCl. Dilute.	1.	None	Varian Techtron AA 5	1	--	--	--	--	--	--
97	---do-----	1.	---do-----	---do-----	1	--	--	--	--	--	--
HNO ₃ +Hg NO ₃											
182	Dissolve with HNO ₃ + Hg NO ₃ .	2.	None	Perkin-Elmer 103	1	1001.3	60	5.3	--	300.0	55.0
182	---do-----	2.	---do-----	---do-----	1	1243.8	90.8	11.8	--	525.0	45.6
Amonium citrate cold extraction											
2	Amonium citrate-citric acid pH 4.0, 2 min. shake.	0.5	None	Jarrell-Ash 82-800	1	380	29	5.	610	188	8
2	---do-----	0.5	---do-----	---do-----	1	390	27	5.	380	210	9

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued
 [All results are in parts per million (ppm)]

Other digestions--Continued

Lab. No.	Zinc (ppm) In sample numbers						Lead (ppm) In sample numbers						Nickel (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
							Conc. HCl											
97	700	450	210	80	50	115	--	--	--	--	--	--	--	--	--	--	--	--
97	690	440	220	75	40	130	--	--	--	--	--	--	--	--	--	--	--	--
							HNO ₃ +Hg NO ₃											
182	943.0	725.0	73.0	72.5	40.3	98.8	725	825	26	48	23	96	--	--	--	--	--	--
182	701.3	566.7	175.0	--	--	118.8	812.8	1083.3	22	61	43	100	--	--	--	--	--	--
							Amonium citrate cold extraction											
2	120	310	37	43	24	14	157	420	14	33	11	6	6	8	15	17	41	4
2	120	280	40	40	31	13	149	410	12	35	12	6	5	11	17	17	49	4

55

Table 1.--Analytical results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver classified by sample digestion procedure--Continued

[All results are in parts per million (ppm)]

Other digestions--Continued

Lab. No.	Cobalt (ppm) In sample numbers						Silver (ppm) In sample numbers					
	1	2	3	4	5	6	1	2	3	4	5	6
							Conc. HCl					
97	--	--	--	--	--	--	--	--	--	--	--	--
97	--	--	--	--	--	--	--	--	--	--	--	--
							HNO ₃ + HgNO ₃					
182	--	--	--	--	--	--	36.8	15.9	0.6	3.5	0.8	0.9
182	--	--	--	--	--	--	24.0	15.6	1.9	3.6	1.5	1.5
							Ammonium citrate cold extraction					
2	5	6	27	9	21	2	--	--	--	--	--	--
2	5	4	23	3	25	4	--	--	--	--	--	--

51

TABLE 2.--Additional results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver in parts per million.
 included in table 1

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicates	In sample numbers					
						1	2	3	4	5	6
COPPER											
136	HF+HClO ₄ (1+1) attack; HCl+HNO ₃ (2+1) attack; resolution in 10% HCl	0.3	1g/100 ml of La in HCl soln.	PE-403	1	1100	80	15	6500	340	60
136	---do-----	0.3	---do-----	---do---	1	1100	80	15	6000	350	60
133	HNO ₃ digestion; HF treatment of residue.	0.5	-----	Jarrell- Ash	1	1140	156	----	----	298	----
133	HNO ₃ leach.	0.5	-----	---do---	1	1000	114	----	----	288	----
ZINC											
133	HNO ₃ digestion; HF treatment of residue.	0.5	-----	Jarrell- Ash	1	842	550	----	----	64.8	----
133	HNO ₃ leach.	0.5	-----	---do---	1	940	680	----	----	24.5	----
115	HCl+HNO ₃ (3+1); dilute and filter	4.	-----	PE-103	1	980	680	215	80	45	130
115	---do-----	4.	-----	---do---	1	980	760	215	75	45	125
136	HF+HCl(2+1) attack; HCl+HNO ₃ (1+1) attack; soln. in 10% HCl	1.	1g/100 ml of La in HCl soln.	PE-403	1	800	516	228	80	60	132
136	---do-----	1.	---do-----	---do---	1	800	520	228	80	60	132
LEAD											
136	HF+HCl(2+1) attack; HCl+HNO ₃ (1+1) attack; soln. in 10% HCl	1.	1g/100 ml of La in HCl soln.	PE-403	1	720	645	45	50	20	100
136	---do-----	1.	---do-----	---do---	1	720	645	45	50	20	95
216	HCl+HNO ₃ to dry. Soln. in 3N HCl	5.	Ascorbic acid reduction of Fe ⁺⁺⁺ ; Topo, I ⁻ , MIBK	Jarrell- Ash	1	720	720	14	46	14	102
216	---do-----	5.	---do-----	---do---	1	710	630	15	46	14	102

52

TABLE 2.--Additional results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver in parts per million (ppm). Data not included in table 1 --Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicates	In sample numbers					
						1	2	3	4	5	6
NICKEL											
136	HF+HClO ₄ (1+1), soln. in 10% HCl	1.	1g/100 ml of La in HCl soln.	PE-403	1	50	30	100	40	80	30
136	---do---	1.	---do---	---do---	1	50	30	100	40	75	30
1	HNO ₃ leach	--	-----	PE-303	1	---	52	---	30	---	---
62	Solution in (1+1) HCl and HF	1.	-----	Tech. AA5	1	40	40	60	50	90	50
62	---do---	1.	-----	---do---	1	40	30	70	50	90	40
COBALT											
62	Solution in (1+1) HCl and HF	1.	-----	Tech. AA5	1	20	30	60	30	50	40
62	---do---	1.	-----	---do---	1	20	30	50	30	50	30
136	HF+HClO ₄ (1+1) attack; soln. in 10% HCl	1.	1g/100 ml of La in HCl soln.	PE-403	1	20	20	70	20	30	20
136	---do---	1.	---do---	---do---	1	20	15	70	20	30	20
1	HNO ₃ leach	--	-----	PE-303	1	--	36	--	44	--	--
SILVER											
22	HCl+HNO ₃ (3+1) to dry.; soln. in HNO ₃ +HClO ₄ (1+2); dilute	1.	-----	Tech. AA5	1	31.5	18.	<0.5	2.0	<0.5	<0.5
22	---do---	1.	-----	---do---	1	31.	17.	0.5	2.5	0.5	1.0
62	HCl+HNO ₃ (3+1) to dry.; HF to dry; soln. in HCl	10.	-----	PE-303	1	29	17	---	---	---	<1.
62	---do---	10.	-----	---do---	1	27	16	---	---	---	<1.
93	HCl+HNO ₃ digestion; dilute	5.	-----	Tech. AA4	2	35	20.7	2.7	4.5	2.	1.7
93	---do---	5.	-----	---do---	2	33	20.	2.5	4.5	2.	1.7

TABLE 2.--Additional results obtained by atomic absorption for copper, zinc, lead, nickel, cobalt, and silver in parts per million (ppm). Data not included in table 1 --Continued

Lab. No.	Method of digestion	Sample wt. (g)	Repression of interferences	Instrument	Replicates	In sample numbers					
						1	2	3	4	5	6
SILVER--Continued											
136	Triple attack with HF+HClO ₄ +HNO ₃ ; single attack with HCl+HNO ₃ ; soln. in 10% HCl	2.	-----	PE-403	1	30.0	17.0	2.7	4.0	1.5	1.
136	---do-----	2.	-----	---do---	1	30.2	17.5	2.7	4.0	1.5	1.
109	Dissolution with 25% HNO ₃	2.	-----	PE-303	1	13	18	1	3	1	1
109	---do-----	2.	-----	---do---	1	10	18	1	2	1	1
115	25ml HNO ₃ +3ml 15% H ₂ O ₂ digestion. Diluted and filtered	4.	-----	PE-103	1	14	15	3	5	1	2
115	---do-----	4.	-----	---do---	1	15	15	<1	5	<1	<1
130	Pyrosulfate fusion; 1+3 HNO ₃ digestion of melt	0.25	TOTP in MIBK	PE-403	1	28	15	<0.2	3.1	0.5	0.2
130	---do-----	0.25	-----	---do---	1	28	15	<0.2	3.1	0.6	0.2
106	HNO ₃ +HgNO ₃ ; dilute	1.	-----	V. Tech. AA4	1	32	17	2.5	3.5	1.5	1.5
106	---do-----	1.	-----	---do---	1	32	17	2.5	4.0	1.5	1.5
2	HNO ₃ +HgNO ₃ digest for 1 hr.; dilute and filter	1.	-----	Jarrell-Ash 8%-800	1	31.2	16.7	3.4	4.1	1.3	1.8
2	---do-----	1.	-----	---do---	1	29.9	16.2	3.4	3.9	2.0	1.8
36	KCN digestion for 1 hr.	2.5	-----	Tech. AA5	1	26.0	14.0	0.15	0.1	0.6	0.2
36	---do-----	2.5	-----	---do---	1	25.0	14.0	0.45	0.1	0.6	0.2
95	Fire assay collection in lead; lead scorified and then dissolved in HNO ₃	10.	-----	PE-403	1	28.4	17.6	<0.25	2.8	0.85	<0.25
95	---do-----	10.	-----	---do---	1	29.5	16.9	<0.25	2.7	0.63	<0.25
1/ The following data for silver were given by standard fire assay.											
17	Standard fire assay	1 assay ton	-----	-----	1	22.	15.	---	---	---	---

TABLE 3.--Analytical results obtained by X-ray fluorescence for copper, zinc, lead, nickel, cobalt and silver in parts per million (ppm)

Lab. No.	Sample preparation	Sample wt.	Counting time	Comments of analyst	Instrument	Replicate	In sample numbers					
							1	2	3	4	5	6
COPPER												
17	K ₂ S ₂ O ₇ fusion	0.2	-----	-----	Philips PW1540	1	1090	----	----	7020	----	----
17	---do-----	0.2	-----	-----	---do---	1	1020	----	----	6910	----	----
68	Pelletized in "Spec cap"--no binder or backing	3.	Counts collected at sample and standard peaks	Computer corrections for diff. in mass absorption of sample & std.	Philips PW1220	1	1640	111	14	9020	576	99
68	Pelletized with 3 drops of 2% Mowiol & backed with boric acid	3.	---do-----	---do-----	---do---	1	1525	105	17	9470	580	94
98	Pelletized	5.	10 sec.	Empirical measurement of mass abs. coefft.	Philips Manual	1	1120	80	----	6710	380	60
98	---do-----	5.	---do-----	---do-----	---do---	1	1160	80	----	6660	355	60
140	Pelletize under 20 ton pressure	---	4 sec.	Semiquant. calibration for -80 mesh soil samples	Siemens SRS/LT	1	685	181	<10	8430	617	136
140	---do-----	---	---do-----	---do-----	---do---	1	716	265	<10	8450	638	112
140	Fusion LiB ₄ O ₇ / H ₃ BO ₄ /NH ₄ NO ₃	0.4	---do-----	Semiquant., no matrix correction	---do---	1	460	130	<20	5500	470	100
140	---do-----	0.4	---do-----	---do-----	---do---	1	460	120	<20	5600	420	60
178	Pressed powder pellets	4.	-----	-----	Philips PW1410	1-2	971	71	23	6500	328	61
178	---do-----	4.	-----	-----	---do---	1-2	1084	69	23	6800	339	65

TABLE 3.--Analytical results obtained by X-ray fluorescence for copper, zinc, lead, nickel, cobalt and silver in parts per million (ppm)--Continued

Lab. No.	Sample preparation	Sample wt.	Counting time	Comments of analyst	Instrument	Replicate	In sample numbers					
							1	2	3	4	5	6
ZINC												
68	Pelletized in 20 ton press with 3 drops Mowiol soln. backed with H ₃ BO ₄	3.	Adjusted to give R.S.D. of <3%	Interferences subtracted computer correction for sample vs. std	Philips PW1220	1	759	587	250	94	71	144
68	Pelletized in spec cap--no binder and no backing	3.	---do-----	---do-----	---do-----	1	822	607	249	96	58	145
140	Pelletizing under 20 ton pressure	---	4 sec.	Semiquant. for rapid rec. calibrated for -80 mesh soil	Siemens SRS/LP	1	576	1120	103	86	63	169
140	---do-----	---	---do-----	---do-----	---do-----	1	590	1120	112	113	78	174
140	Fusion with LiB ₄ O ₇ /H ₃ BO ₄ /NH ₄ NO ₃	0.1	---do-----	No matrix correction	---do-----	1	360	670	80	50	80	130
140	---do-----	0.1	---do-----	---do-----	---do-----	1	350	630	75	70	60	120
178	Fpressed powder pellets	4.	-----	-----	Philips PW1410	1-2	782	566	217	81	54	130
178	---do-----	4.	-----	-----	---do-----	1-2	837	540	225	84	58	137
LEAD												
68	Pelletized without binder or backing	3.	Counting times adjusted to give R.S.D. less than ± 3%	Computer corrections for differences in mass abs. coeff.	Philips PW1220	1	686	625	4	14	12	79
68	Pelletized with Mowiol and backing with boric acid	3.	---do-----	---do-----	---do-----	1	617	630	<3	13	14	81
98	Pelletize	5.	-----	-----	Philips Manual	1	---	720	---	---	---	95
93	---do-----	5.	-----	-----	---do-----	1	---	700	---	---	---	90

TABLE 3.--Analytical results obtained by X-ray fluorescence for copper, zinc, lead, nickel, cobalt and silver in parts per million (ppm)--Continued

Lab. No.	Sample preparation	Sample wt.	Counting time	Comments of analyst	Instrument	Replicate	In sample numbers							
							1	2	3	4	5	6		
LEAD--Continued														
140	Fusion:LiB ₄ O ₇ / H ₃ BO ₄ /NH ₄ NO ₃	0.1	20 sec.	Semiquant., no matrix correction	Siemens SRS/LP	1	290	700	<10	60	50	105		
140	---do-----	0.1	---do-----	---do-----	---do-----	1	290	700	<10	60	50	100		
140	Pelletize under 20 ton pressure	---	20 sec.	Semiquant. for rapid rec. calibrated for -80 mesh soil	---do-----		227	806	<20	44	50	93		
140	---do-----	---	---do-----	---do-----	---do-----		233	780	<20	68	70	92		
178	Pressed powder pellets	4.	-----	-----	Philips PW1410	1-2	734	700	39	58	17	103		
178	---do-----	4.	-----	-----	---do-----	1-2	801	684	40	56	16	113		
NICKEL														
68	Pelletized without binder or backing	3.	Counting times adjusted to give R.S.D. less than ±3%	Computer corrections for differences in mass abs. coeff.	Philips PW1220	1	41	26	76	51	89	32		
68	Pelletized with Mowiol and backing with boric acid	3.	---do-----	---do-----	---do-----	1	40	24	73	55	87	32		
178	Pressed powder pellets	4.	-----	-----	Philips PW1410	1-2	37	19	64	37	69	24		
178	---do-----	4.	-----	-----	---do-----	1-2	43	18	67	41	71	26		
COBALT														
140	Fusion:LiB ₄ O ₇ /H ₃ BO ₄ / NH ₄ NO ₃	0.1	4 sec.	Semiquant. no matrix correction	Siemens SRS/LP	1	110	12	64	13	29	28		
140	---do-----	0.1	---do-----	---do-----	---do-----	1	106	7	66	12	26	32		
140	Pelletize under 20 ton pressure	---	2 sec.	Semiquant. calibrated for -80 mesh soil samples	---do-----	1	166	<15	84	<15	27	30		
140	---do-----	---	---do-----	---do-----	---do-----	1	163	<15	92	<15	29	36		
SILVER														
178	Pressed powder pellets	4.	-----	-----	Philips PW1410	1-2	27	14	<3	<3	<2	<2		
178	---do-----	4.	-----	-----	---do-----	1-2	30	16	<3	<3	<2	<2		

TABLE 4.--Analytical results obtained by colorimetry for copper, zinc, lead, nickel, and cobalt in parts per million (ppm)

Lab. No.	Method of digestion	Sample wt.	Repression of interferences	Color-forming agent	Extraction solvent	Instrument	Replicates	In sample numbers					
								1	2	3	4	5	6
COPPER													
43	KHSO ₄ fusion, leach into 1N HCl	0.25	Buffer soln = sodium acetate, KNa tartrate and hydroxylamine hydrochloride	2-2' biquinoly	-----	Visual	1	1280	60	64	3200	400	64
43	-----	0.25	---do-----	---do-----	-----	---do-----	1	1000	40	40	5000	400	64
149	KHSO ₄ fusion, leach into 0.5N HCl	0.1	Buffer soln-Na acetate, KNa tartrate, ascorbic acid	---do-----	Isoamyl alcohol	---do-----	1	782	61	<5	6342	312	45
149	---do-----	0.1	---do-----	---do-----	---do-----	---do-----	1	778	58	<5	5575	313	43
8	Leach with 5M HCl + 0.5% H ₂ O ₂	1.	NH ₄ citrate hydroxylamine pH2-3	Lead diethyldithiocarbamate	Toluene	B&L Spec. 20	1	880	300	37	4000	120	420
8	---do-----	1.	---do-----	---do-----	---do-----	---do-----	1	345	75	153	2300	330	130
95	HF, HCl, HNO ₃ , HClO ₄	2.	-----	Neo-cuproine	CHCl ₃	Beckman DU	1	---	79	4	---	376	73
95	---do-----	2.	-----	---do-----	---do-----	---do-----	1	---	84	4	---	403	72
132	HClO ₄ @ 180°C in glycerine bath	0.5	Buffered to pH to 7	2-2' biquinoline	Isoamyl alcohol	Visual	1	1000	110	<.1	9000	200	6
182	---do-----	0.5	---do-----	---do-----	---do-----	---do-----	1	1000	100	26	5000	500	50

85

TABLE 4.--Analytical results obtained by colorimetry for copper, zinc, lead, nickel, and cobalt in parts per million (ppm)--Continued

Lab. No.	Method of digestion	Sample wt.	Repression of interferences	Color-forming agent	Extraction solvent	Instrument	Replicates	In sample numbers					
								1	2	3	4	5	6
ZINC													
182	Conc. HClO ₄ @ 180°C in glycerine bath	0.5	pH4-5	Dithizone	Tetrachlor	Visual	1	200	200	24	70	130	60
182	---do-----	0.5	---do-----	---do-----	---do-----	---do-----	1	540	590	84	84	36	50
149	KHSO ₄ fusion. Leach 0.5 N HCl	0.1	NaF; Na acetate, Na ₂ S ₂ O ₃ ; acetic acid	Dithizone @ pH 5.5-6.0	C ₆ H ₆	---do-----	1	153	141	68	66	48	58
149	---do-----	0.1	---do-----	---do-----	---do-----	---do-----	1	156	149	65	62	51	62
LEAD													
43	25% HNO ₃ digestion	0.1	Buffer amonium citrate, hydrocylamine, KCN	Dithizone	C ₆ H ₆	Visual	1	500	500	15	30	20	60
43	---do-----	0.1	---do-----	---do-----	---do-----	---do-----	1	500	500	15	30	20	60
149	4M HNO ₃ digestion	0.1	(pH 9.5-9.8)	---do-----	---do-----	---do-----	1	527	567	<10	29	10	71
149	---do-----	0.1	---do-----	---do-----	---do-----	---do-----	1	527	593	<10	28	9	71
132	Digest with HClO ₄ @ 180°C	0.5	pH 8.5-90	---do-----	Tetrachlor	---do-----	1	1800	1300	4	90	60	150
132	---do-----	0.5	---do-----	---do-----	---do-----	---do-----	1	160	220	2	8	10	60

55

TABLE 4.--Analytical results obtained by colorimetry for copper, zinc, lead, nickel, and cobalt in parts per million (ppm)--Continued

Lab. No.	Method of digestion	Sample wt.	Repression of interferences	Color-forming agent	Extraction solvent	Instrument	Replicates	In sample numbers						
								1	2	3	4	5	6	
NICKEL														
8	Boiling 5M HCl+0.6% H ₂ O ₂	1.	(NH ₄) ₃ citrate, NH ₄ OH, NaF	Dimethyl-glyoxime	CHCl ₃	B&L Spec. 20	1	340	110	63	40	70	85	
8	---do---	1.	---do---	---do---	---do---	---do---	1	230	50	110	43	200	68	
43	K ₂ S ₂ O ₇ fusion:leach with IN HCl	0.25	-----	2.2 Diquinoly	-----	Visual	1	120	28	72	----	60	32	
43	---do---	0.25	-----	---do---	-----	---do---	1	84	24	60	----	60	32	
95	HF/HCl/HNO ₃ /HClO ₄ dissolution	2.	-----	Dimethyl glyoxime	CHCl ₃	Beckman DU	1	21	15	64	44	75	17	
95	---do---	2.	-----	---do---	---do---	---do---	1	35	15	58	46	76	15	
149	K ₂ S ₂ O ₇ fusion:leach with 0.5N HCl	0.25	(NH ₄) ₃ citrate + NH ₄ OH;pH 10.3+ 0.1	α-furildioxime	C ₆ H ₆	Visual	1	65	19	46	379	73	26	
149	---do---	0.25	---do---	---do---	---do---	---do---	1	62	23	45	427	70	24	
182	K ₂ S ₂ O ₇ fusion	1.	Extract at pH 7.5; re-extract with 0.5 MHC1	Dimethyl-glyoxime	CHCl ₃	Elko-II photometer	1	1900	3200	4600	4600	5900	1900	
182	---do---	1.	---do---	---do---	---do---	---do---	1	1600	1600	1600	1400	1300	3500	
COBALT														
95	HF/HCl/HNO ₃ /HClO ₄ dissolution	2.	-----	Nitroso R complex	-----	Beckman DU	1	12	8	40	16	31	12	
95	---do---	2.	-----	---do---	-----	---do---	1	12	7	40	13	31	11	
43	K ₂ S ₂ O ₇ fusion leached with .5M HCl	0.01	Buffer soln. sodium acetate, hydrocyclamine hydrochloride tetra-sodium pyrophosphate	-----	TRI-N-Butylamine	-----	1	20	20	50	20	30	20	
43	---do---	0.01	---do---	-----	---do---	-----	1	10	12	36	12	34	20	

09

Tables

5 - 43

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