

第Ⅲ部 結論および提言

第III部 結論および提言

第1章 結論

本年度の調査結果から、以下のような結論が得られた。

1. 本地域には、銅の鉱徴地として主に次の3地区がある。

- a. La Guanaca 鉱徴地
- b. Rinconada 鉱徴地
- c. 中央鉱徴地

上記鉱徴地のうち、aおよびbは、既知鉱徴地であるが、cの中央鉱徴地は、今回の調査で新たに見つかったものである。この他にも、全域的に、石英脈に伴う青緑色酸化銅鉱徴が散在する。

2. 各鉱徴地は次のような特徴を持つ。

a. La Guanaca 鉱徴地

- ・ 鉱染タイプおよび脈タイプの二種類の鉱化作用が存在する。
一つは、ポーフィリー中の黄銅鉱・黄鉄鉱鉱染鉱床であり、他の一つは、花崗閃緑岩(Gd3)中に認められる酸化銅脈である。酸化銅脈には、二つの種類があり、一つは石英脈を伴うものと、石英を伴わず花崗閃緑岩の節理面に沿って酸化銅のみが脈状に産するものである。脈タイプでは、後者の方が多く、これは、supergene で生じたものと考えられる。
- ・ 変質は、セリサイト変質が顕著である。緑色黒雲母やカリ長石化も認められる。緑簾石変質はない。
- ・ 銅、モリブデンの地化学異常帯である。鉛、亜鉛の地化学異常はない。
- ・ 典型的なポーフィリー型銅鉱床に見られる、石英脈ストックワークに伴う銅の鉱化作用は観察されないが、以上のような鉱化変質作用の特徴からポーフィリー型の鉱化作用と考えられる。

b. Rinconada 鉱徴地

- ・ 石英脈にともなう酸化銅脈タイプである。
銅の他に、金、鉛、亜鉛の鉱化作用が認められる。酸化銅中に初生鉱物である黄銅鉱が残存することから、酸化銅は、exoticなものではなく、初生の銅鉱物がある場で酸化して生じたと考えられる。
- ・ 石英脈は、アブライト質花崗岩中(Ag)に産する。
- ・ 変質は、脈際セリサイト変質がある。石英脈中には、電気石および緑簾石が多く観察

される。脈から離れた花崗岩では、緑簾石および緑泥石変質が顕著である。脈およびその周辺に認められるスメクタイトは、supergene スメクタイトと考えられる。

- Au, Ag, As, Sb, Cu, Mo, Pb, および Zn の 8 元素すべての異常が重なる。
- 特に、Au, Ag, Pb については高い異常値をもつ。
- 石英脈の流体包有物の均質化温度は、約 200~310° を示す。塩濃度は大部分は 0~0.35wt%NaCl equiv. と低いが、一部に 10~5wt%NaCl equiv. と比較的高い値を示すものがある。

c. 中央鉍徴地

- 石英脈に伴う酸化銅脈タイプである。
酸化銅中には、黄銅鉱が残存しており、石英脈にともなうその場での銅鉍化作用である。
- 脈際変質はセリサイトである。脈際だけではなく、周辺も弱いセリサイト変質を受けている。
- Cu の他に、Au, Ag, As, Pb, Zn の地化学異常が認められる。
- 流体包有物均質化温度は、約 300~340° C であり、比較的高塩濃度(9~12wt % NaCl equiv.)のもの、低塩濃度(3wt%NaCl equiv.)のものがある。
- 以上のことから、本地区には、比較的高温で、マグマ成分をある程度保持した熱水活動があったと推定される。

La Guanaca 鉍徴地、Rinconada 鉍徴地および中央鉍徴地の鉍化作用の特徴から、これらの鉍化作用は、ポーフィリー型銅鉍化作用の中心付近と周辺を示していると考えられる。また、Rinconada 鉍徴地と中央鉍徴地では、中央鉍徴地のほうがよりポーフィリー型銅鉍化作用の中心に近いと推定される。ただし、以上は、平面的ゾーニングを考えた場合であり、垂直的ゾーニングを仮定すれば、Rinconada 鉍徴地の下部にもポーフィリー型銅鉍化作用の中心が存在する可能性もある。

第2章 提言

本年度の調査結果から、第2年次の調査として、以下のようなボーリング調査を提言する。

- 中央鉍徴地区でのボーリング調査
- Rinconada 鉍徴地区でのボーリング調査
- La Guanaca 鉍徴地周辺でのボーリング調査

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圖表一覽

圖一覽

- Fig. 1 Location map of the Guanaca area.
- Fig. 2 Location map of the survey area.
- Fig. 3 JERS-1 image of the Guanaca area.
-
- Fig.1-2-1 Topographic map of the Guanaca area and surrounding.
- Fig.1-2-2 Porphyry copper deposits and prospects for which supergene alunite ages have been obtained in relation to the morphotectonic provinces of northern Chile (Sillitoe, 1996)
-
- Fig.1-3-1 Schematic geological map of the Copiapó-El Salvador region (Comejo et al., 1993)
- Fig.1-3-2 Location of the Survey area and metallogenic belts in the central Andes (Sillitoe, 1992)
- Fig.1-3-3 Exploration model for the Survey area based on existing data prior to this survey
- Fig.1-4-1 Geological map of the Guanaca area
-
- Fig.2-1-1 Lithological map of the Guanaca area.
- Fig.2-1-2 Lithological sections of the Guanaca area, section a-a', b-b', and c-c'.
- Fig.2-1-3 Stratigraphic relationships of rocks outcropping in the Guanaca area
- Fig.2-1-4 Harker diagrams
- Fig.2-1-5 Photograph of lapilli tuff (Dpf)
- Fig.2-1-6 Photograph of Ocoitic andesite (Oa).
- Fig.2-1-7 Photograph shows the contact between the Ocoitic andesite and the Green andesite (Ga).
- Fig.2-1-8 Photograph shows the contact between the Ocoitic andesite and the Green andesite (Ga) above. The point of the hammer marks the boundary between the Ocoitic andesite (Oa) and the Green andesite (Ga). Plagioclase phenocrysts are parallel to the contact.
- Fig.2-1-9 Photograph of the outcropping Rhyolitic volcanic breccia (Rd).
- Fig.2-1-10 Modal composition of granitoid rocks.
- Fig.2-1-11 Distribution of the mineralization and prospects.

- Fig 2-1-12 Photograph shows the contact between Hb-Pl porphyry (Hp) and Granodiorite3 (Gd3).
- Fig 2-1-13 Detailed geological map based on tape and compass measurements of the La Guanaca Prospect
- Fig 2-1-14 Chrysocolla vein in Granodiorite (Gd3) at the La Guanaca prospect.
- Fig 2-1-15 Photograph of the hydrothermal brecciation zone in the La Guanaca Prospect.
- Fig 2-1-16 View of the Rinconada Prospect and outcropping geology
- Fig 2-1-17 Quartz vein with green copper mineralization at the Rinconada Prospect
- Fig 2-1-18 Quartz vein with green copper mineralization at the Rinconada Prospect
- Fig 2-1-19 Quartz vein with green copper mineralization at the Central Prospect.
- Fig 2-1-20 Close-up of Fig. 2-1-19
-
- Fig 2-2-1(1) Distribution of geochemical anomalies (Au)
- Fig 2-2-1(2) Distribution of geochemical anomalies (Ag)
- Fig 2-2-1(3) Distribution of geochemical anomalies (As)
- Fig 2-2-1(4) Distribution of geochemical anomalies (Sb)
- Fig 2-2-1(5) Distribution of geochemical anomalies (Cu)
- Fig 2-2-1(6) Distribution of geochemical anomalies (Mo)
- Fig 2-2-1(7) Distribution of geochemical anomalies (Pb)
- Fig 2-2-1(8) Distribution of geochemical anomalies (Zn)
-
- Fig 2-3-1 Th vs. salinity for fluid inclusions, samples 207, La Escondida; 137532 and 137672, Central; 137572, east of Rinconada; 137803, south of Rinconada; 137887, near Cerro El Pimiento; and f-3 ~ J, Rinconada.
- Fig 2-3-2 Homogenization temperatures of fluid inclusions from the Central and Rinconada Prospects.
- Fig 2-3-3 Concentrations for selected elements in mineralized samples from the La Guanaca, Central, and Rinconada Prospects.
-
- Fig 2-4-1 Location of geophysical survey lines
- Fig 2-4-2 Concept of IP method
- Fig 2-4-3 Configuration of dipole-dipole array
- Fig 2-4-4 Relationship between chargeability and resistivity of rocks and ores
- Fig 2-4-5 Panel diagram of apparent resistivity section
- Fig 2-4-6 Panel diagram of chargeability section

- Fig 2-4-7 Plan of apparent resistivity and chargeability (n=1)
 Fig 2-4-8 Plan of apparent resistivity and chargeability (n=2)
 Fig 2-4-9 Plan of apparent resistivity and chargeability (n=3)
 Fig 2-4-10 Plan of apparent resistivity and chargeability (n=4)
 Fig 2-4-11 Plan of apparent resistivity and chargeability (n=5)
 Fig 2-4-12 Section of simulated results (Line A)
 Fig 2-4-13 Section of simulated results (Line B)
 Fig 2-4-14 Section of simulated results (Line C)
 Fig 2-4-15 Section of simulated results (Line D)
 Fig 2-4-16 Section of simulated results (Line E)
 Fig 2-4-17 Section of simulated results (Line F)
 Fig 2-4-18 Section of simulated results (Line G)
 Fig 2-4-19 Section of simulated results (Line H)
 Fig 2-4-20 Section of simulated results (Line I)
 Fig 2-4-21 Section of simulated results (Line J)
 Fig 2-4-22 Section of simulated results (Line K)
 Fig 2-4-23 Section of simulated results (Line L)
 Fig 2-4-24 Panel diagram of simulated models
 Fig 2-4-25 Comprehensive analysis of geophysical survey
- Fig. 2-5-1 Exploration model following the phase II survey in the Guanaca Area.

表一覽

- Table 1-1-1 Survey specifications
 Table 1-1-2 Laboratory work specifications
- Table 1-4-1 Summary of Prospect characteristics
- Table 2-2-1 Basic statistical values of elements analysed
 Table 2-2-2 Correlation coefficients among each element analysed.
- Table 2-3-1 Chemical analysis for the mineralized samples.
 Table 2-3-2 K-Ar age of sericite and rock samples

Table 2-4-1 Specifications of geophysical survey

Table 2-4-2 List of equipment and materials

Table 2-4-3 List of sampling time

Table 2-4-4 Results of sample measurement

卷末資料一覽

Appendix 1	Existing data list
Appendix 2	Bulk composition of rock
Appendix 3	Modal composition of the granitoid rocks
Appendix 4	Results of chemical analysis of samples from geochemical survey
Appendix 5 (1)	Cumulative frequency distribution (Au)
Appendix 5 (2)	Cumulative frequency distribution (Ag)
Appendix 5 (3)	Cumulative frequency distribution (Ag)
Appendix 5 (4)	Cumulative frequency distribution (As)
Appendix 5 (5)	Cumulative frequency distribution (Sb)
Appendix 5 (6)	Cumulative frequency distribution (Sb)
Appendix 5 (7)	Cumulative frequency distribution (Cu)
Appendix 5 (8)	Cumulative frequency distribution (Cu)
Appendix 5 (9)	Cumulative frequency distribution (Mo)
Appendix 5 (10)	Cumulative frequency distribution (Mo)
Appendix 5 (11)	Cumulative frequency distribution (Pb)
Appendix 5 (12)	Cumulative frequency distribution (Zn)
Appendix 5 (13)	Cumulative frequency distribution (Zn)
Appendix 6	Criteria for the assignment of symbols to X-ray diffraction analysis
Appendix 7	Results of X-ray powder diffraction analysis
Appendix 8 (1)	Homogenization temperatures and salinities of fluid inclusions (137672)
Appendix 8 (2)	Homogenization temperatures and salinities of fluid inclusions (137532)
Appendix 8 (3)	Homogenization temperatures and salinities of fluid inclusions (J)
Appendix 8 (4)	Homogenization temperatures and salinities of fluid inclusions (f-3)
Appendix 8 (5)	Homogenization temperatures and salinities of fluid inclusions (t-2)
Appendix 8 (6)	Homogenization temperatures and salinities of fluid inclusions (207)
Appendix 8 (7)	Homogenization temperatures and salinities of fluid inclusions (137572)
Appendix 8 (8)	Homogenization temperatures and salinities of fluid inclusions (137887)
Appendix 8 (9)	Homogenization temperatures and salinities of fluid inclusions (137803)

Appendix 9	Apparent resistivities and Chargeabilities of field measurements
Appendix 10	Apparent resistivities and Chargeabilities of samples
Appendix 11	Coordinates of survey stations

付図一覧

Sheet 1	Sample location map
Sheet 2	Lithological map of the Guanaca area.
Sheet 3	Lithological map of the Guanaca area. section a-a', b-b', and c-c'.
Sheet 4	Detailed geological map based on tape and compass measurements of the Rinconada Prospect

APENDICES

Appendix 1 Existing data list

[Documents]

- P.Cornejo P., C.Mpodozis M., C.F.Ramirez R., and A.J.Tomlinson(1993): ESTUDIO GEOLOGICO DE LA REGION DE PORTERILLOS Y EL SALVADOR(26°-27°Lat.S). SERVICIO NACIONAL DE GEOLOGIA Y MINERIA,CORPORACION NACIONAL DEL COBRE DE CHILE.pp.469.
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[maps]

- Geographical map 1:500,000;COPIAPO 2600-6815 2 sheets
- Geographical map 1:250,000;EL SALVADOR 2600-6900
- Geographical map 1:50,000;MOSTAZAL 2630-6930
- Geographical map 1:50,000;PORTAL DEL INCA 2615-6930

- Geographical map 1:50,000;SAN ANDRES 2645-6930(original)
- Geographical map 1:50,000;LLANO SAN PEDRO DE CACHIYOYO 2630-6945
- Geographical map 1:50,000;ESTACION LLANTA 2615-6945
- Geographical map 1:50,000;INCA DE ORO 2645-6945
- Mining concession map 1:50,000;
- Trail map of aerial photograph 1:250,000

[Photographs]

- aerial photographs 1:40,000 prints
- aerial photographs 1:40,000 photographic possitive film
- Landsat image
- JERS-1dataOPS358
- JERS-1dataOPS678

Appendix 2 Bulk composition of rock

sample No.	255A	255B	271A	271B	103021	137509	197515	137616
rock name	Ga	Ga	An1	An3	G33	G13	G43	Ba
major(%)								
SiO2	57.74	57.28	49.33	50.9	61.52	63.05	63.62	55.32
TiO2	0.8	0.83	0.88	0.83	0.57	0.59	0.61	1.15
Al2O3	16.74	16.91	14.61	14.27	16.64	16.43	16.2	16.93
Cr2O3	0	0	0.01	0.01	0	0	0	0
Fe2O3	6.65	6.55	7.45	7.12	5.82	4.98	4.97	7.77
MnO	0.2	0.2	0.12	0.14	0.09	0.1	0.12	0.09
MgO	2.15	2.31	6.7	6.67	2.51	2.09	2.12	3.2
CaO	4.14	3.8	6.07	6.53	4.96	4.43	4.23	4.3
Na2O	3.45	3.11	3.72	3.65	3.5	3.83	3.56	4.5
K2O	4.21	5.53	2.05	1.95	2.34	2.94	3	1.95
P2O5	0.24	0.23	0.31	0.29	0.17	0.15	0.15	0.3
LOI	2.29	1.69	7.21	7.44	1.51	0.65	1.09	3.02
Total	98.61	98.44	99.44	99.8	99.73	99.24	99.67	98.53
trace(ppm)								
Ba	1190	1625	550	570	700	930	800	410
Rb	121	142	86	82	85	91	94	96
Sr	430	433	572	586	458	452	416	302
Nb	8	8	6	6	18	14	14	8
Zr	192	201	114	111	120	165	150	150
Y	20	20	16	16	20	20	18	24
REE(ppm)								
La	no	no	no	no	18	22	19	no
Ce	no	no	no	no	42	46	42	no
Pr	no	no	no	no	4.6	5.6	5.2	no
Nd	no	no	no	no	21	22	22	no
Sm	no	no	no	no	3	4	4	no
Eu	no	no	no	no	1	1	1	no
Gd	no	no	no	no	3	3.8	3.6	no
Tb	no	no	no	no	0.7	0.6	0.5	no
Dy	no	no	no	no	3.5	3.5	3	no
Ho	no	no	no	no	0.6	0.6	0.6	no
Er	no	no	no	no	1.5	1.5	1.5	no
Tm	no	no	no	no	0.3	0.3	0.2	no
Yb	no	no	no	no	1.8	1.5	1.5	no
Lu	no	no	no	no	0.2	0.2	0.3	no
K	42100	55300	20500	19500	23400	29100	30000	19500
Norm(%)								
Q	10.42	7.41	0.1	2.05	18.47	17.78	19.77	8.54
C								0.32
or	24.88	32.68	12.11	11.52	13.83	17.37	17.73	11.52
ab	29.19	26.32	31.43	30.89	29.62	32.41	30.12	38.08
an	17.76	15.85	17.11	16.79	22.78	18.96	19.36	19.37
di			6.58	8.85		0.3		
wo			3.53	4.75		0.16		
en			3.05	4.1		0.14		
fs								
hy	5.36	5.75	13.64	12.51	6.25	5.07	5.28	7.97
ca	5.36	5.75	13.64	12.51	6.25	5.07	5.28	7.97
il	0.43	0.43	0.26	0.3	0.19	0.21	0.26	0.19
ha	6.65	6.55	7.45	7.12	5.82	4.98	4.97	7.77
tn	0.86	1.06	1.78	1.65	0.5	1.17	0.45	
ru	0.23	0.17			0.36		0.29	1.05
ap	0.58	0.53	0.72	0.67	0.39	0.35	0.35	0.7
total	96.36	96.75	91.23	92.35	98.21	98.6	98.58	95.51

sample No.	137618	137620	137632	96110118	96110419	96110420	96110421	96110422
sample No.	Oa	M	Dj	Ag	Ad	Ad	MJ	MJ
SiO2	53.58	61.36	74.56	68.44	59.81	59.76	57.21	56.06
TiO2	1.33	0.83	0.24	0.49	0.93	0.94	1.05	1.03
Al2O3	18.09	15.95	12.57	13.61	15.69	15.87	15.82	15.83
Cr2O3	0	0	0	0	0	0	0	0
Fe2O3	8.64	5.98	1.04	2.93	5.62	5.8	6.99	6.79
MnO	0.07	0.12	0.06	0.06	0.11	0.12	0.12	0.13
MgO	1.6	1.83	0.58	1.03	2.31	2.55	3.55	3.25
CaO	5.74	3.7	2.65	1.97	3.96	3.29	5.96	5.49
Na2O	3.25	3.8	1.68	1.98	3.72	3.19	3.23	3.76
K2O	3.35	3.88	4.25	6.33	4.32	4.59	3.01	3.71
P2O5	0.43	0.22	0.06	0.1	0.27	0.25	0.27	0.26
LOI	2.18	1.22	1.17	1.41	2.01	2.22	1.43	2.22
Total	98.27	98.91	99.06	98.41	98.78	98.58	98.67	98.52
Ba	570	935	675	620	680	705	600	555
Rb	132	114	126	340	196	208	122	178
Sr	334	276	290	128	494	414	492	374
Nb	10	12	20	18	14	14	16	14
Zr	276	309	189	318	246	237	270	264
Y	42	38	22	30	26	26	26	26
REE(ppm)								
La	no	no	no	167.57	8.11	209	86.49	72.97
Ce	no	no	no	134.38	8.33	159.38	68.75	62.5
Pr	no	no	no	107.14	9.29	157.14	57.14	52.14
Nd	no	no	no	91.55	8.45	122.54	46.48	42.25
Sm	no	no	no	54.35	10.43	77.83	24.35	23.91
Eu	no	no	no	24.44	7.78	50	14.44	14.44
Gd	no	no	no	50.65	9.35	47.74	20.32	19.03
Tb	no	no	no	46.67	10	33.33	15	13.33
Dy	no	no	no	50	9.21	26.05	13.16	13.95
Ho	no	no	no	50	8.89	22.22	11.11	8.89
Er	no	no	no	62	10	20	10	12
Tm	no	no	no	60	7.5	15	7.5	10
Yb	no	no	no	64.8	6.8	16.8	7.2	9.2
Lu	no	no	no	50	10	15	10	7.5
K	33500	38800	42500	63300	43200	45900	30400	37100
Norm								
Q	8.5	14.78	42.15	27.22	11.4	13.49	11.24	6.31
C			0.73	0.16		0.27		
or	19.8	22.93	25.12	37.41	25.53	27.13	17.97	21.93
ab	27.59	32.15	14.22	16.75	31.48	26.99	27.33	31.82
an	24.83	15	12.75	9.12	13.35	14.69	19.69	15.26
Ji					1.34		3.84	5.53
vo					0.72		2.06	2.97
en					0.62		1.78	2.56
fs								
ty	3.99	4.56	1.44	2.57	5.21	6.35	7.06	5.53
en	3.99	4.56	1.44	2.57	5.21	6.35	7.06	5.53
il	0.15	0.26	0.13	0.13	0.23	0.26	0.26	0.28
hm	8.64	5.98	1.04	2.99	5.62	5.8	6.99	6.79
ln	0.59	1.35			1.98		2.24	2.17
ru	1.01	0.19	0.17	0.42		0.8		
ap	1	0.51	0.14	0.23	0.63	0.58	0.63	0.6
total	96.1	97.71	97.89	97	96.77	96.36	97.25	96.32

Appendix 3

Modal composition of the granitoid rocks

classification on the geological map	Qz	Pl	Kf	felsic total	Bio	Ho	Opx	Cpx	Cab	Maf	mafic total	silicate total	Opq	Total
137911	77	1026	446	1549 79.89%	0	222	0	0	0	168 color index	390 20.11%	1939	61	2000
96110419	267	689	608	1564 80.16%	14	109	0	0	16 color index	248 19.84%	387 11.42%	1951	49	2000
96110420	227	1092	411	1730 88.58%	26	69	0	2	4 color index	122 17.86%	223 20.70%	1953	47	2000
96110421	83	1126	378	1587 82.14%	49	24	2	102	2 color index	166 10.57%	345 4.42%	1932	68	2000
96110422	92	708	732	1532 79.30%	4	181	0	0	14 color index	201 10.57%	400 20.70%	1932	68	2000
137946	218	881	660	1759 89.43%	24	104	0	6	0 color index	74 88	208 4.42%	1967	33	2000
G-1	560	370	972	1902 95.58%	0	0	0	0	0 color index	85 101	88 5.09%	1990	10	2000
G-3	511	342	1029	1882 94.91%	0	0	0	0	0 color index	101 257	101 13.31%	1983	17	2000
96110418	445	212	1037	1694 86.69%	3	0	0	0	0 color index	257 282	260 20.05%	1954	46	2000
137621	146	1073	324	1543 79.95%	0	105	0	0	0 color index	282 28	387 8.13%	1930	70	2000
137620	242	770	752	1764 91.88%	28	96	0	0	4 color index	28 3	155 13.48%	1920	80	2000
257	362	1118	214	1594 86.52%	154	106	1	0	0 color index	3 132	264 13.43%	1958	42	2000
137796	422	1134	140	1696 86.57%	46	85	0	0	0 color index	132 57	263 22.90%	1959	41	2000
137762	347	1037	121	1505 77.10%	188	220	0	2	0 color index	57 23	447 14.07%	1952	48	2000
137515	438	988	259	1685 85.93%	136	117	0	0	0 color index	23 6	276 19.01%	1961	39	2000
G-8	282	1157	162	1561 80.93%	152	213	0	0	0 color index	6 371	371 19.01%	1952	48	2000

Appendix 4 Results of chemical analysis of samples from geochemical survey

sample No	Au(ppb)	Ag(ppm)	As(ppm)	Cu(ppm)	Mo(ppm)	Pb(ppm)	Sb(ppm)	Zn(ppm)
137759	2.5	0.1	8	82	1	17	1.8	82
137836	2.5	0.1	1	29	1	24	0.6	52
137732	2.5	0.1	1	14	0.5	2	0.6	20
137758	2.5	0.1	14	12	3	0.5	1.2	6
137769	2.5	0.1	1	56	2	0.5	0.1	66
137776	2.5	0.1	6	17	1	6	2.6	50
137782	2.5	0.1	4	34	2	0.5	3.2	38
137784	2.5	0.1	1	26	1	3	0.4	28
137942	85	0.1	4	4	0.5	1	0.2	22
137950	25	0.2	6	215	2	44	1.8	230
137951	2.5	0.2	10	45	1	3	0.6	6
137955	5	0.1	14	137	2	1	0.4	38
137956	2.5	0.1	12	6	0.5	0.5	1	28
137958	2.5	0.2	12	5	0.5	0.5	0.6	30
137982	2.5	0.1	4	64	1	3	0.1	20
137991	2.5	0.1	14	44	0.5	9	3	40
137992	2.5	0.1	16	205	0.5	13	2.8	55
137993	2.5	0.1	42	108	1	32	2.4	60
137994	2.5	0.1	14	82	0.5	0.5	0.4	14
96102810	2.5	0.5	10	300	2	70	1	2450
96102813	2.5	0.6	4	235	1	348	0.2	5200
96102816	2.5	0.1	10	142	2	0.5	0.4	50
96102819	2.5	0.1	10	18	1	10	0.8	300
16	2.5	0.1	1	32	0.5	0.5	0.1	45
18	2.5	0.1	4	75	0.5	0.5	0.1	98
24	2.5	0.1	12	56	0.5	2	0.6	36
26	2.5	0.1	30	6	0.5	0.5	1.4	27
83	2.5	0.4	1	119	0.5	0.5	0.2	38
213	2.5	0.1	12	10	2	7	1.2	78
227	2.5	0.1	6	15	1	0.5	1.8	55
233	2.5	0.2	6	1650	19	102	0.1	2400
236	2.5	0.1	18	121	2	1	0.2	87
137504	2.5	0.1	8	177	0.5	0.5	0.4	12
137506	2.5	0.2	16	29	1	12	1.6	108
137507A	2.5	0.1	20	17	1	4	1.2	40
137525	2.5	0.1	1	25	1	14	1	62
137547	2.5	0.1	8	22	1	6	0.4	68
137552	2.5	0.2	6	12	2	0.5	0.4	44
137560	2.5	0.1	8	47	2	4	0.1	40
137607	2.5	0.1	10	5	0.5	2	3.8	57
137610	2.5	0.1	12	5	0.5	0.5	0.2	34
137614	2.5	0.1	6	5	0.5	0.5	0.4	52
137615	15	2.6	56	730	5	28	17.5	130
137617	2.5	0.2	14	25	1	2	0.4	110
137618	2.5	0.2	18	12	2	2	0.2	52
137626	2.5	0.2	64	33	1	16	3.6	90
137627	2.5	0.1	18	45	1	3	2	120
137629	2.5	0.1	12	3	2	5	0.2	19
137632	2.5	0.1	10	14	2	8	0.2	43
137634	2.5	0.1	26	51	2	14	1	92
137641	2.5	0.1	6	240	1	0.5	0.6	37
137643	2.5	0.1	38	23	1	0.5	2.2	36
137645	2.5	0.1	20	14	1	0.5	0.8	62
137646	2.5	0.4	12	176	1	8	1.6	94
137659	2.5	0.1	8	9	1	10	0.6	75

sample No	Au(ppb)	Ag(ppm)	As(ppm)	Cu(ppm)	Mo(ppm)	Pb(ppm)	Sb(ppm)	Zn(ppm)
137660	2.5	0.1	22	75	1	13	1.4	88
137662	2.5	0.1	18	81	1	8	0.8	78
137663	2.5	0.2	32	146	0.5	20	1	68
137665	2.5	0.2	16	15	1	5	1.4	60
137668	2.5	0.1	24	305	2	10	1.8	52
137675	2.5	0.1	16	30	4	30	2.2	54
137678	2.5	0.1	12	26	0.5	12	0.8	70
137679	2.5	0.1	10	33	1	10	0.4	55
137680	2.5	0.1	10	37	1	19	1	29
137681	2.5	0.1	4	13	0.5	6	0.4	25
137689	2.5	0.1	10	184	2	37	0.6	360
137701	2.5	0.6	4	830	2	0.5	0.6	48
137704	2.5	0.1	6	26	1	0.5	0.1	12
137710	2.5	0.1	20	63	1	20	3.2	135
137712	2.5	0.1	1	81	2	37	0.2	50
137714	2.5	0.1	6	46	1	0.5	0.6	28
137718	2.5	0.2	6	145	2	11	1	98
137730	2.5	0.1	10	22	1	2	1.8	86
137731	2.5	0.1	1	56	1	8	0.4	48
137824	2.5	0.1	18	10	1	12	1.6	50
137827	2.5	0.1	10	26	1	1	0.2	26
137828	2.5	0.1	10	16	1	3	3.8	68
78	2.5	0.1	1	35	1	33	0.6	70
137736	2.5	0.1	1	30	2	7	0.2	7
137738	2.5	0.1	1	48	1	0.5	0.4	48
137740	2.5	0.1	1	4	1	9	0.4	10
137741	2.5	0.1	6	52	2	2	0.8	36
147745	2.5	0.1	18	25	0.5	11	0.8	112
137748	2.5	0.1	16	21	2	12	1.6	68
137749	2.5	0.1	10	7	0.5	3	0.4	60
137741	2.5	0.1	1	8	2	6	0.8	65
137909	2.5	0.1	6	102	0.5	0.5	0.1	62
137910	2.5	0.1	24	9	0.5	3	1	53
137914	2.5	0.1	30	21	0.5	6	1	44
137920	2.5	0.1	1	100	0.5	14	0.4	145
137940	2.5	0.1	6	22	1	0.5	0.2	58
96102403	2.5	0.1	30	48	1	9	1	232
96102404	2.5	0.1	18	68	1	8	1.4	168
96102508	2.5	0.1	12	50	1	10	0.2	78
96102512	2.5	0.1	1	15	2	2	0.6	66
96102515	2.5	0.1	6	42	2	3	0.8	56
61	2.5	0.1	4	39	0.5	0.5	0.1	50
63	2.5	0.1	6	33	0.5	0.5	0.1	30
65	2.5	0.1	12	275	0.5	0.5	0.8	27
69	2.5	0.2	1	32	0.5	4	0.2	72
71	2.5	0.1	1	17	0.5	8	0.4	60
79	2.5	0.1	1	32	0.5	0.5	0.2	62
82	2.5	0.1	4	10	0.5	2	0.2	70
91	2.5	0.1	26	255	1	4	1.8	113
92	2.5	0.1	6	19	1	0.5	0.4	54
93	2.5	0.1	6	30	1	0.5	0.1	9
94	2.5	0.1	14	3	0.5	0.5	0.4	60
95	2.5	0.1	8	28	1	0.5	0.1	47
97	2.5	0.1	10	15	0.5	0.5	1.4	50
98	2.5	0.1	22	11	1	1	0.4	87

sample No	Au(ppb)	Ag(ppm)	As(ppm)	Cu(ppm)	Mo(ppm)	Pb(ppm)	Sb(ppm)	Zn(ppm)
99	2.5	0.1	8	26	1	87	0.2	125
257	2.5	0.2	4	57	1	12	0.1	15
259	2.5	0.1	4	88	2	31	0.2	56
262	2.5	0.1	4	8	1	0.5	0.1	17
264	2.5	0.1	1	59	1	5	0.1	150
267	2.5	0.1	54	21	1	0.5	0.8	23
278	2.5	0.1	1	300	0.5	3	0.1	27
300	2.5	0.1	1	9	1	0.5	0.1	55
137569	2.5	0.4	14	230	0.5	22	0.1	138
137577	2.5	0.1	6	184	1	0.5	0.1	170
137580	2.5	0.1	4	16	1	2	0.1	78
137581	2.5	0.1	10	210	0.5	17	0.1	150
137582	2.5	0.1	1	65	1	8	0.1	62
137583	2.5	0.1	1	52	1	0.5	0.1	53
137584	2.5	0.1	8	62	0.5	0.5	0.1	52
137585	2.5	0.1	12	70	0.5	11	0.1	120
137588	2.5	0.1	12	24	1	9	1	28
137594	2.5	0.1	1	8	0.5	0.5	0.1	15
137596	2.5	0.1	8	5	1	0.5	0.2	105
137597	2.5	0.1	14	9	2	3	0.8	94
137709	2.5	0.1	4	50	1	6	0.8	68
137713	2.5	0.1	1	6	2	0.5	0.4	105
137724	2.5	0.1	1	19	2	0.5	0.2	60
137728	2.5	0.2	1	63	1	60	6.4	90
137899	2.5	0.1	1	27	2	13	0.1	26
137931	70	0.4	6	600	2	98	0.8	276
137657	2.5	0.1	1	28	0.5	4	0.1	9
137677	2.5	0.1	10	67	0.5	7	0.2	24
285	2.5	0.2	10	116	1	24	0.8	74
286	2.5	0.1	8	83	2	32	0.6	83
137508	2.5	0.1	6	62	2	15	0.8	68
137624	2.5	0.1	18	157	2	18	1.2	78
137625	2.5	0.1	14	115	2	11	1	75
137636	2.5	0.1	18	116	2	14	0.8	100
137637	2.5	0.1	10	78	2	14	0.6	72
137638	2.5	0.1	12	90	1	12	0.6	82
137639	2.5	0.1	10	69	1	12	0.8	72
137640	2.5	0.1	16	129	2	10	0.8	58
137711	2.5	0.1	14	105	2	14	0.8	76
137734	2.5	0.1	14	153	2	15	1	72
137834	2.5	0.1	4	69	4	7	0.8	42
137695	2.5	0.1	20	38	2	14	0.6	50
137735	2.5	0.1	8	101	1	11	1	74
96110418	2.5	0.1	1	40	2	10	0.8	43
137554	2.5	0.1	4	175	2	13	0.1	48
137812	35	0.1	28	56	0.5	0.5	1.8	50
137818	10	0.1	18	54	0.5	0.5	0.6	30
137820	5	0.1	16	22	1	18	1	29
137838	10	0.1	8	92	2	0.5	0.4	33
137843	2.5	0.1	8	63	1	14	0.4	90
137844	15	0.1	12	26	0.5	4	0.6	43
137856	2.5	0.1	6	35	0.5	0.5	0.1	35
137858	2.5	0.1	6	27	2	0.5	0.1	24
137894	2.5	0.1	1	14	2	7	0.1	65
137895	2.5	0.1	1	74	3	7	0.2	30

sample No	Au(ppb)	Ag(ppm)	As(ppm)	Cu(ppm)	Mo(ppm)	Pb(ppm)	Sb(ppm)	Zn(ppm)
137526	2.5	0.1	4	26	1	15	0.4	50
137527	2.5	0.1	1	58	1	2	0.1	38
137752	2.5	0.1	6	8	1	5	0.4	31
137764	2.5	0.1	1	42	1	4	0.2	43
137765	2.5	0.1	1	33	0.5	7	0.2	33
137767	2.5	0.1	1	12	2	3	0.2	40
137773	2.5	0.1	1	50	2	10	0.2	75
137792	2.5	0.1	1	43	1	2	0.2	35
137795	2.5	0.1	1	8	1	5	0.2	90
137796	2.5	0.1	1	11	1	4	0.4	70
137797	2.5	0.1	1	16	1	4	0.2	65
137548	2.5	0.1	4	56	2	11	0.2	45
137912	2.5	0.1	6	32	0.5	0.5	0.2	18
137912H	2.5	0.1	6	50	0.5	0.5	0.2	21
137913	2.5	0.1	8	39	0.5	0.5	0.2	18
137924	2.5	0.2	1	153	1	3	0.2	40
137937	10	0.1	12	81	1	2	0.4	72
137941	2.5	0.1	14	107	0.5	7	0.8	68
137946	10	0.1	10	86	2	7	0.1	42
57	2.5	0.1	4	72	0.5	2	0.2	53
62	2.5	0.1	6	125	0.5	0.5	0.1	30
84	2.5	0.1	1	121	0.5	9	0.1	31
85	2.5	0.1	1	56	1	9	0.1	53
275	2.5	0.1	1	73	0.5	9	0.1	35
281	2.5	0.1	1	75	1	2	0.1	25
137557	2.5	0.1	10	89	2	5	0.1	40
137809	40	0.1	22	10	1	2	1.2	56
137871	2.5	0.1	20	196	2	11	0.2	68
137891	2.5	0.1	1	76	1	8	0.1	45
137840	2.5	0.1	8	81	0.5	21	0.2	76
137837	2.5	0.1	6	109	1	0.5	0.2	50
137563	2.5	0.1	6	51	2	2	0.1	41
137564	2.5	0.1	6	42	1	0.5	0.1	36
137823	2.5	0.1	10	16	2	6	0.2	7
137539	2.5	0.1	20	31	0.5	6	0.1	46
137544	2.5	0.1	44	58	1	3	2.4	28
137546	2.5	0.1	10	23	1	9	0.4	48
137670	2.5	0.1	1	52	2	12	0.1	30
137755	2.5	0.1	94	340	2	5	1.2	48
137757	2.5	0.1	1	2	1	0.5	0.2	25
137760	2.5	0.1	14	33	1	0.5	0.8	37
137761	2.5	0.1	1	4	1	0.5	0.1	31
137530	215	30	130	22700	15	145	5	125
137516	2.5	0.1	4	74	1	23	0.1	70
137517	2.5	0.1	20	13	1	5	0.8	35
137518	2.5	0.1	6	10	1	2	0.8	29
103006	2.5	1.2	4	7200	10	0.5	0.1	60
103008	2.5	2.8	4	9200	15	0.5	0.2	78
103013	2.5	0	0	0	0	0	0	0
103014	2.5	0.4	1	1300	3	0.5	0.1	37
103015	2.5	0.1	8	690	1	0.5	0.1	44
103021	2.5	0.1	1	92	2	0.5	0.1	34
103022	2.5	0.1	1	210	1	0.5	0.1	33
103024	2.5	0.2	4	850	1	0.5	0.1	34
103025	2.5	0.2	6	800	2	2	0.1	65

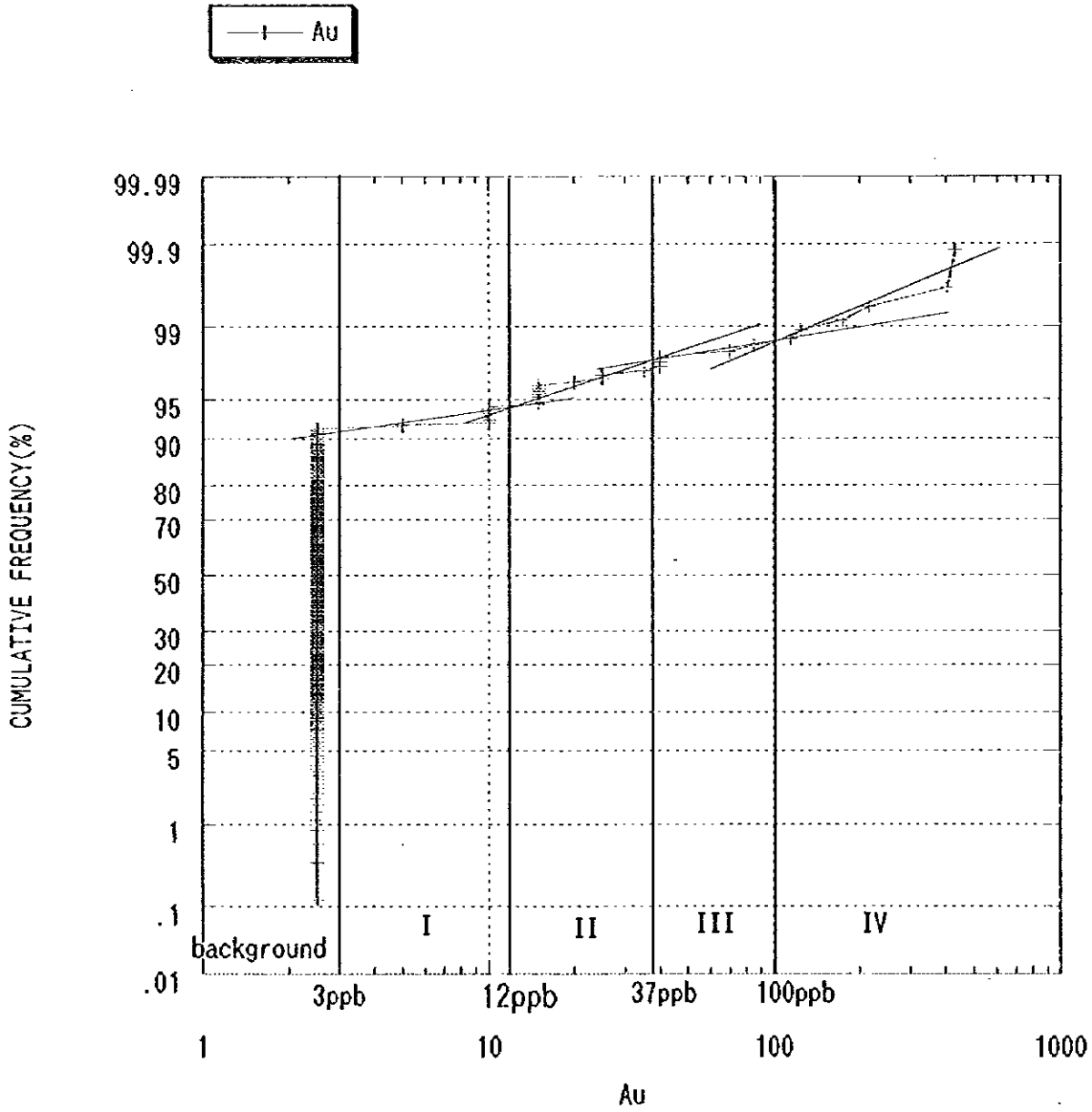
sample No	Au(ppb)	Ag(ppm)	As(ppm)	Cu(ppm)	Mo(ppm)	Pb(ppm)	Sb(ppm)	Zn(ppm)
103026	2.5	0.2	4	49	1	0.5	0.1	28
103032	2.5	0.8	8	2200	1	0.5	0.1	65
103034	2.5	3.2	18	770	385	2	0.2	3
103035	2.5	0.3	58	1050	146	0.5	4.6	9
137528	2.5	0.1	1	550	1	1	0.1	55
137529	2.5	0.1	1	45	1	0.5	0.1	27
137537	2.5	0.1	1	47	2	220	0.6	800
137762	2.5	0.1	1	91	2	0.5	0.1	46
137763	2.5	0.1	1	53	1	0.5	0.1	40
137543	2.5	0.1	1	200	2	6	0.1	47
137985	2.5	0.1	12	11	2	0.5	0.4	29
137954	15	0.1	18	240	2	4	0.2	50
96102815	2.5	0.2	10	15	1	11	1	178
137611	2.5	0.1	6	13	1	5	0.1	22
137612	2.5	0.1	14	19	2	0.5	0.2	43
137620	2.5	0.1	4	122	2	5	0.1	26
137621	2.5	0.1	10	26	1	12	0.4	66
137778	2.5	0.1	1	24	1	5	0.6	72
137779	2.5	0.1	1	26	2	0.5	0.2	32
137781	2.5	0.1	4	14	1	2	1.2	150
137783	2.5	0.1	1	18	2	12	0.2	18
137800	10	0.1	4	106	2	11	2.4	70
137906	2.5	0.1	6	9	0.5	52	1.2	206
137930	2.5	0.1	4	5	0.5	2	0.2	48
137932	40	0.2	1	11	1	6	0.4	48
137935	2.5	0.1	1	13	0.5	3	0.2	25
137939	125	0.1	18	38	1	7	0.6	96
137944	40	0.1	18	112	0.5	0.5	0.6	72
137949	15	0.1	10	126	0.5	9	1.2	95
137996	2.5	0.1	8	6	1	3	0.6	42
137998	2.5	0.1	8	215	0.5	0.5	0.2	63
96102501	2.5	0.1	1	7	0.5	3	0.1	7
96102504	2.5	0.1	6	8	0.5	0.5	0.2	2
96102505	2.5	0.1	6	23	2	4	0.2	22
96102506	2.5	0.1	8	7	3	5	0.1	11
96102507	2.5	0.1	18	7	2	3	0.2	8
96102509	2.5	0.1	14	27	4	6	0.2	22
96102510	2.5	0.1	6	5	4	1	0.4	4
96102513	15	0.1	6	17	6	26	0.2	19
96102514	2.5	0.1	6	38	1	5	0.4	75
137522	2.5	0.1	12	12	1	0.5	0.8	43
137523	2.5	0.1	14	18	1	5	1.8	45
137541	2.5	0.1	10	17	1	6	1	48
137542	2.5	0.1	1	24	2	0.5	0.2	24
137589	2.5	0.1	12	6	1	0.5	0.4	35
137595	2.5	0.1	10	12	0.5	2	0.1	30
137616	2.5	0.1	40	36	1	3	0.6	136
137682	2.5	0.1	1	15	0.5	5	0.4	32
137686	2.5	0.1	8	2	1	2	0.2	34
137691	2.5	0.1	8	12	0.5	7	0.1	35
137692	2.5	0.1	6	18	1	4	0.1	28
137693	2.5	0.1	8	7	1	4	0.2	27
137903	2.5	0.1	12	25	2	0.5	0.8	26
137907	2.5	0.3	22	255	0.5	11	1.2	100
137928	2.5	0.3	2	245	1	0.5	0.4	58

sample No	Au(ppb)	Ag(ppm)	As(ppm)	Cu(ppm)	Mo(ppm)	Pb(ppm)	Sb(ppm)	Zn(ppm)
137943	10	0.1	4	300	1	0.5	0.6	98
80	2.5	0.1	1	191	0.5	2	0.1	56
221	2.5	0.5	10	940	1	4	0.2	130
266	2.5	0.6	8	245	0.5	5	0.8	165
137770	2.5	0.1	1	27	3	10	0.2	6
137790	2.5	0.1	10	12	1	0.5	0.4	120
137801	2.5	0.2	1	147	2	20	0.2	52
137805	2.5	0.2	1	178	3	2	0.2	56
96110401	2.5	0.1	1	7	2	4	0.6	55
96110410	2.5	0.1	1	18	2	14	0.4	93
a-5	2.5	2.7	4	320	2	62	1	242
c-1-a	2.5	0.9	4	210	2	82	2	205
c-1-b	2.5	0.9	1	220	1	100	0	214
d-4	2.5	2	1	820	2	110	1.4	270
e	2.5	0.1	8	139	1	3	1	68
e-8	2.5	6.2	4	375	2	167	1.8	280
f-2	2.5	10.8	4	610	2	9650	0	212
g-1	2.5	6.5	1	1280	1	170	2.4	285
g-7	2.5	3.6	4	900	2	70	1.2	195
h-2	2.5	3.4	1	1050	1	140	1.2	206
h-3	2.5	2.8	1	1900	1	530	2.2	315
h0515	15	0.4	20	1100	2	13	2.2	110
Z-1	2.5	0.1	1	11	1	5	0.4	100
Z-2	2.5	0.2	1	25	2	4	0.4	83
Z-3	2.5	0.1	1	16	1	13	0.6	26
Z-7	2.5	0.1	1	19	1	3	0.2	70
Z-9	2.5	0.1	1	53	2	6	0.4	114
Z-10	2.5	0.1	1	20	2	6	0.8	80
Z-11	2.5	3.6	1	620	2	74	1.6	160
Z-13	2.5	0.1	2	26	2	6	0.2	65
Z-14	2.5	0.1	1	26	1	13	0.2	90
Z-17	2.5	0.1	2	30	1	25	0.2	63
Z-18	2.5	0.1	4	31	1	36	0.2	102
Z-19	2.5	0.1	1	39	2	32	1	58
Z-20	2.5	0.2	1	67	1	42	1.4	270
Z-24	2.5	0.1	1	17	1	3	2	96
Z-26	2.5	0.1	1	24	2	19	0.4	55
i-3	2.5	4.6	1	360	0.5	125	1.4	285
k-3	2.5	7.7	4	2800	0.5	120	1	60
L-4	2.5	13.6	2	1650	0.5	5300	1.4	215
N-4	2.5	0.8	1	92	0.5	166	2	170
RO-0	2.5	0.5	1	235	1	130	0.8	103
205	405	43	20	6690	5	560	5	260
206	430	3	20	365	2.5	95	5	190
0	2.5	0.1	1	101	0.5	5	0.1	64
2	2.5	0.1	1	48	0.5	0.5	0.1	44
H7	2.5	0.1	1	36	0.5	5	0.1	36
J9	2.5	0.1	1	26	0.5	8	0.1	50
GCA12A	2.5	0.1	4	78	0.5	3	0.1	28
GCA12B	2.5	0.1	1	121	0.5	8	0.4	420
54	2.5	0.1	6	34	0.5	19	1	50
55	2.5	0.1	6	61	0.5	2	1.2	51
81	2.5	0.1	1	4	0.5	0.5	0.2	66
86	2.5	0.1	1	31	1	5	0.4	40
87	2.5	0.1	4	27	1	11	0.1	41

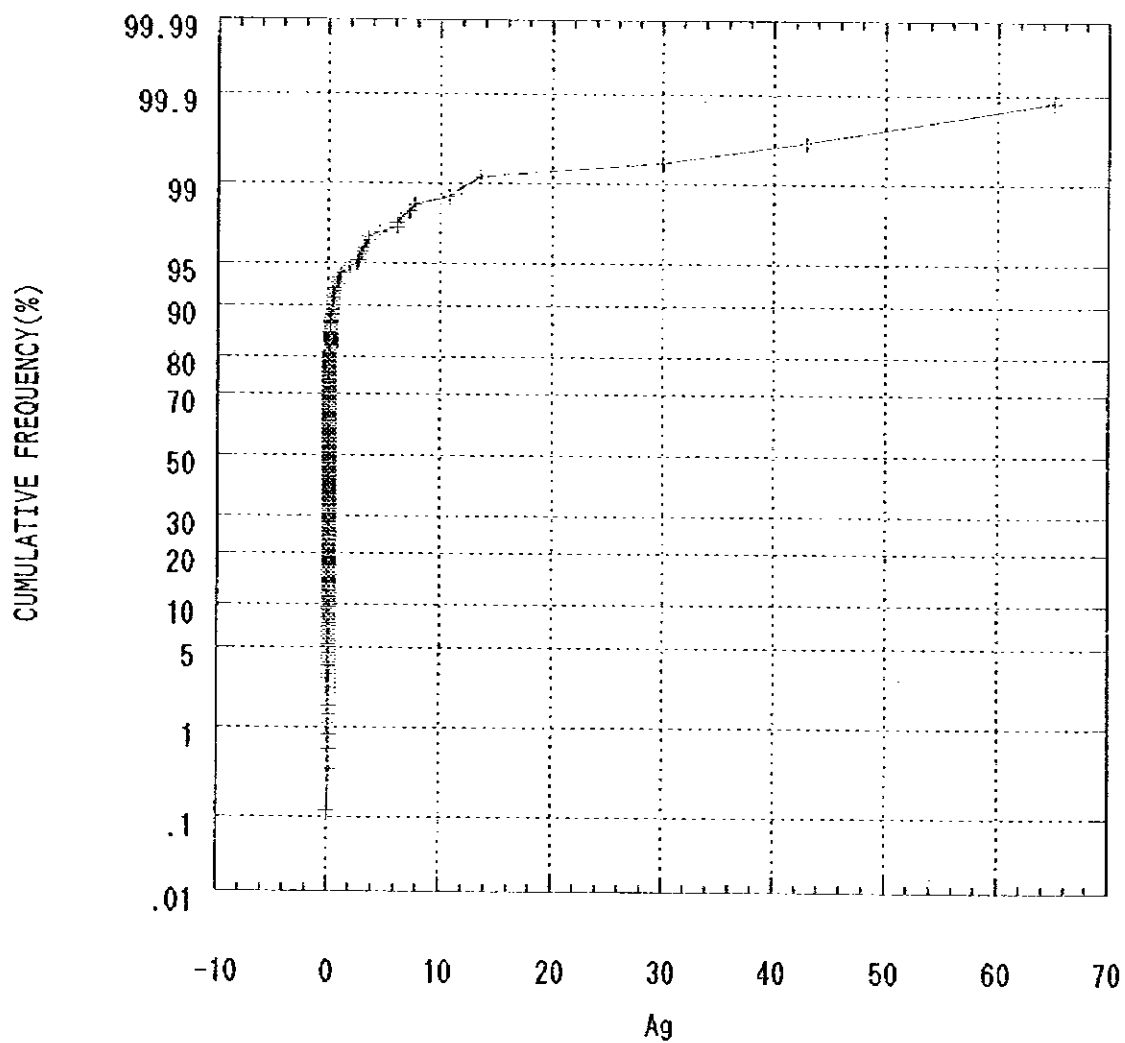
sample No	Au(ppb)	Ag(ppm)	As(ppm)	Cu(ppm)	Mo(ppm)	Pb(ppm)	Sb(ppm)	Zn(ppm)
88	2.5	0.1	1	22	0.5	7	0.1	37
89	2.5	0.1	4	23	0.5	0.5	0.2	116
90	115	0.1	1	33	2	13	0.8	55
270	2.5	0.1	4	49	1	28	0.1	63
282	2.5	0.1	1	36	1	32	0.1	150
283	2.5	0.1	4	42	2	14	0.1	50
293	2.5	0.1	1	10	2	8	0.1	75
296	2.5	0.1	4	35	0.5	20	0.1	53
298	2.5	0.1	4	22	3	7	0.1	26
137697	2.5	0.1	4	27	1	21	0.6	67
137699	2.5	0.1	4	28	1	3	0.8	102
RO-0	10	0.4	1	19	1	310	1	180
RO-1	2.5	0.1	1	20	0.5	13	0.8	150
RO-3	2.5	7.3	4	1650	0.5	2900	28	195
RO-3-2	2.5	6.2	6	1800	0.5	3750	60	212
RO-4	15	11.8	2	4450	0.5	7800	1.8	168
RO-4-2	175	65	26	10000	0.5	10000	7.2	250
RO-5	2.5	0.2	4	183	0.5	280	8	240
RO-6	2.5	0.1	1	50	0.5	200	1.2	195
RO-7	2.5	0.2	1	87	0.5	300	3	170
RO-8	2.5	0.8	4	275	0.5	150	1.6	188
RO-9	10	1.1	1	730	0.5	850	4.6	174
RO-10	2.5	0.4	1	290	0.5	114	2	172
RO-11	2.5	0.2	2	22	0.5	130	1.2	172
RO-12	2.5	1.8	1	186	0.5	3150	6.2	290
RO-13	2.5	0.1	1	77	0.5	360	3	245
RO-14	2.5	1.8	2	1050	0.5	640	1.8	85
RO-15	2.5	0.1	1	33	0.5	45	1.2	122
RO-16	2.5	0.1	1	17	0.5	21	0.8	130
X-3	2.5	0.1	2	8	0.5	9	0.6	135
X-6	2.5	0.1	4	26	0.5	16	0.2	46
X-7	2.5	0.1	4	18	0.5	42	0.6	70
X-9	2.5	0.1	1	18	0.5	23	0.2	52
X-11	2.5	0.1	1	20	1	8	0.2	34
X-13	2.5	0.1	2	19	0.5	18	0.6	142
X-14	2.5	0.1	1	22	1	8	0.4	130
X-16	2.5	0.1	1	13	0.5	10	0.8	122
X-18	2.5	0.1	1	17	1	2	0.4	88
X-20	2.5	0.1	1	10	1	2	1	86
X-21	2.5	0.1	2	62	1	100	2.2	164
X-23	2.5	0.1	2	12	0.5	8	0.8	60
X-25	2.5	0.1	4	29	2	13	0.6	68
X-27	2.5	0.1	1	14	1	6	0.4	40
X-29	2.5	0.1	1	15	1	7	2.2	125
X-32	2.5	0.1	1	6	1	3	0.4	58
Y-3	2.5	0.1	2	33	2	11	0.6	77
Y-5	2.5	0.1	2	6	1	12	0.4	58
Y-6	2.5	0.1	1	7	2	3	0.6	132
Y-7	2.5	0.1	1	8	2	3	0.6	82
Y-9	2.5	0.1	1	31	1	10	0.6	44
Y-10	2.5	0.1	1	12	2	4	0.6	83
Y-12	2.5	0.1	1	13	1	3	0.8	75
Y-14	2.5	0.1	1	16	2	5	0.6	140
Y-16	2.5	0.1	2	30	1	5	0.8	75
Y-17	2.5	0.1	1	17	0.5	9	0.2	82

sample No	Au(ppb)	Ag(ppm)	As(ppm)	Cu(ppm)	Mo(ppm)	Pb(ppm)	Sb(ppm)	Zn(ppm)
Y-18	10	0.1	1	5	0.5	4	0.6	96
Y-19	2.5	0.1	4	9	1	8	0.4	74
Y-20	2.5	0.1	1	12	1	13	0.6	114
Y-21	2.5	0.1	2	31	1	4	1.2	124
Y-23	2.5	0.1	1	4	1	6	1	144
137810	15	0.1	10	24	1	4	0.8	50
137815	20	0.1	22	58	2	0.5	0.8	11
137846	2.5	0.1	6	51	3	55	0.6	186
137850	2.5	0.1	1	12	0.5	6	0.4	33
137853	2.5	0.1	1	47	0.5	0.5	0.2	35
137854	2.5	0.1	1	79	0.5	68	3.8	125
137855	2.5	0.1	1	33	0.5	11	0.4	37
137857	2.5	0.1	8	10	1	5	0.1	20
137861	2.5	0.1	4	28	1	6	0.1	17
137866	2.5	0.1	1	53	1	23	1	180
137870	2.5	0.1	1	74	2	65	0.8	120
137876	2.5	0.1	4	36	2	6	0.6	110
137882	2.5	0.1	1	15	2	5	0.1	36
137884	2.5	0.1	4	84	1	12	0.2	32
137885	2.5	0.1	6	92	2	24	0.2	58
137890	2.5	0.1	4	34	2	14	0.1	40
137896	2.5	0.1	4	40	2	13	0.2	17
137898	2.5	0.1	10	66	1	104	0.2	185
137602	2.5	0.1	1	145	2	0.5	0.1	42

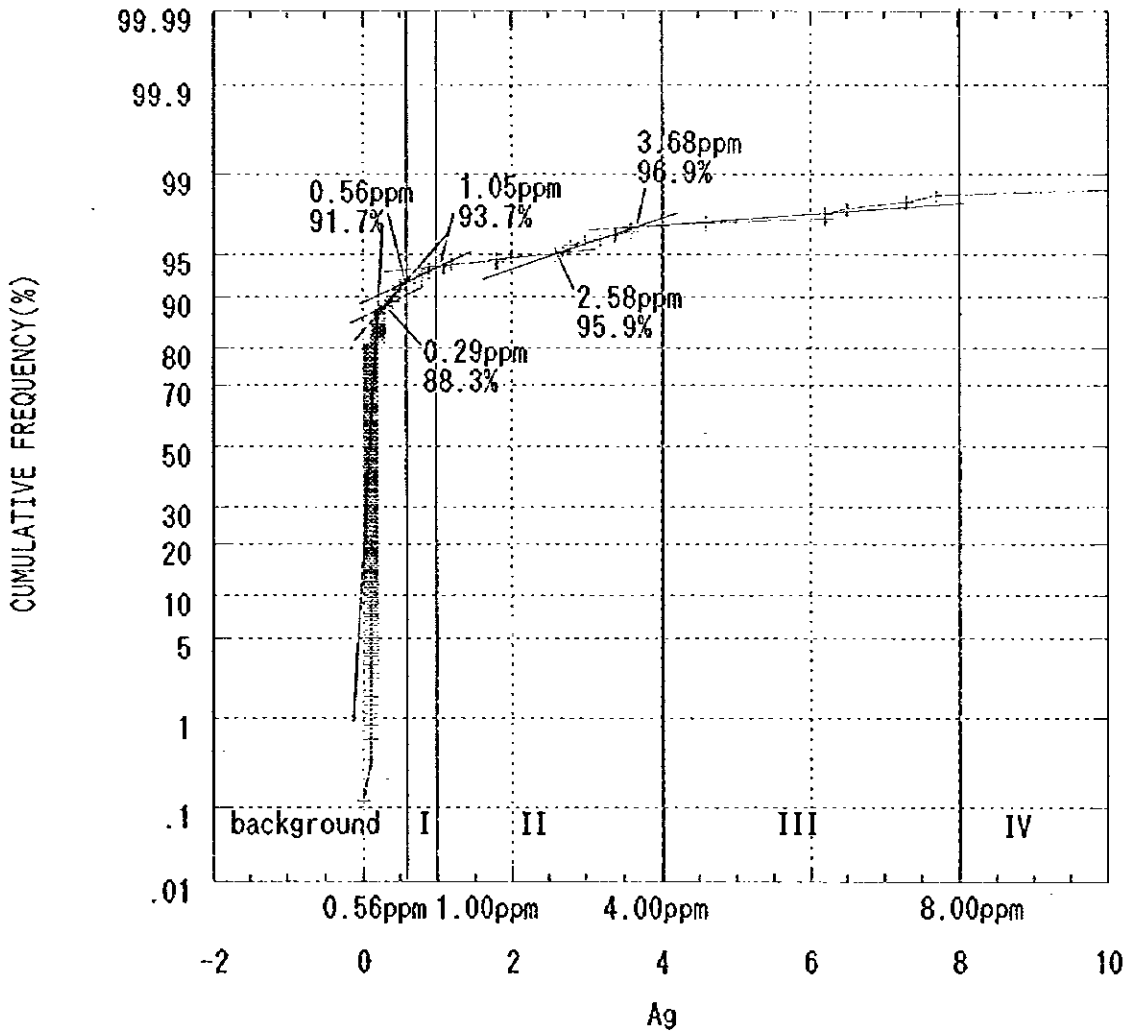
Appendix 5 (1) Cumulative frequency distribution (Au)



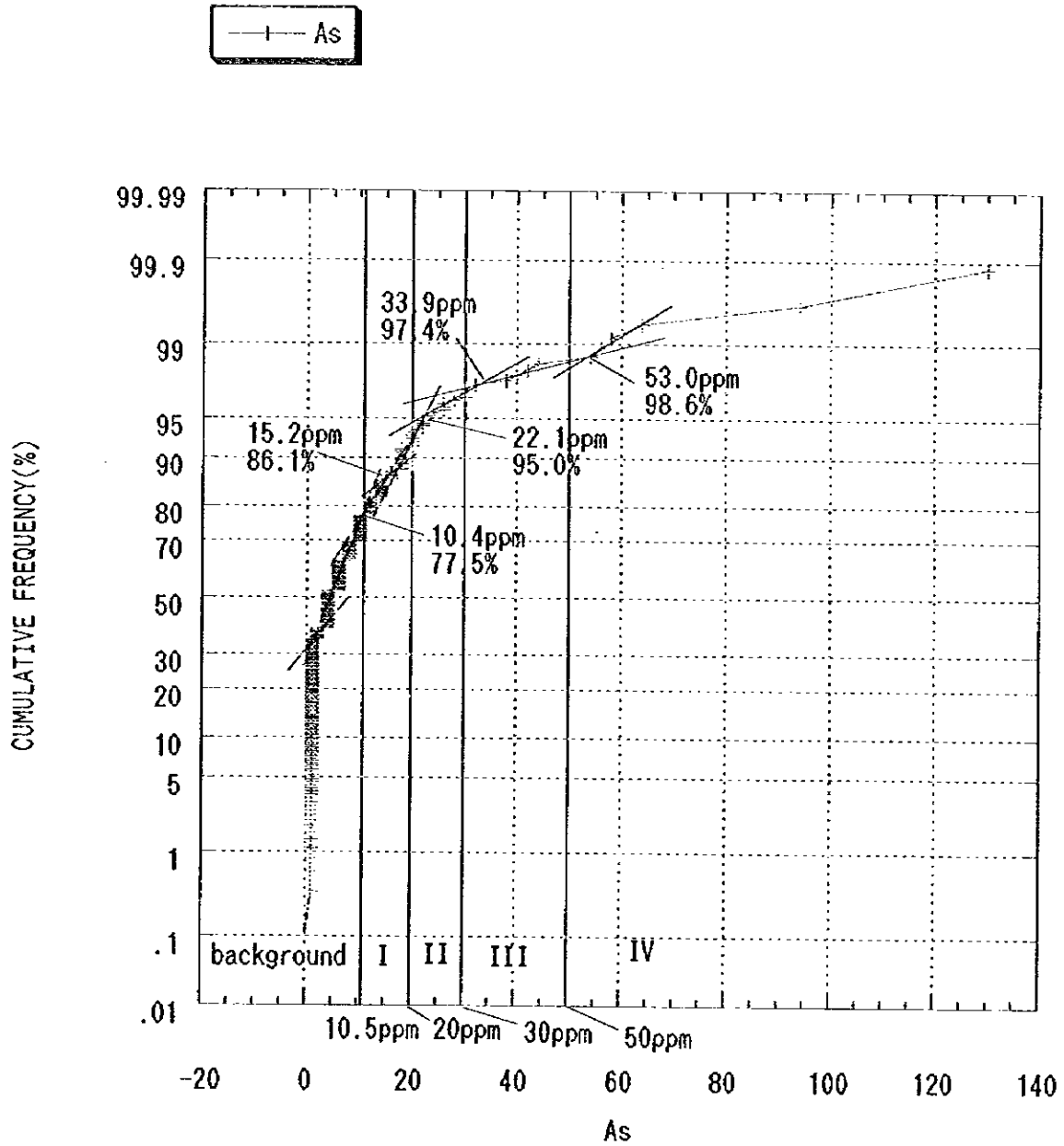
Appendix 5 (2) Cumulative frequency distribution (Ag)



Appendix 5 (3) Cumulative frequency distribution (Ag)

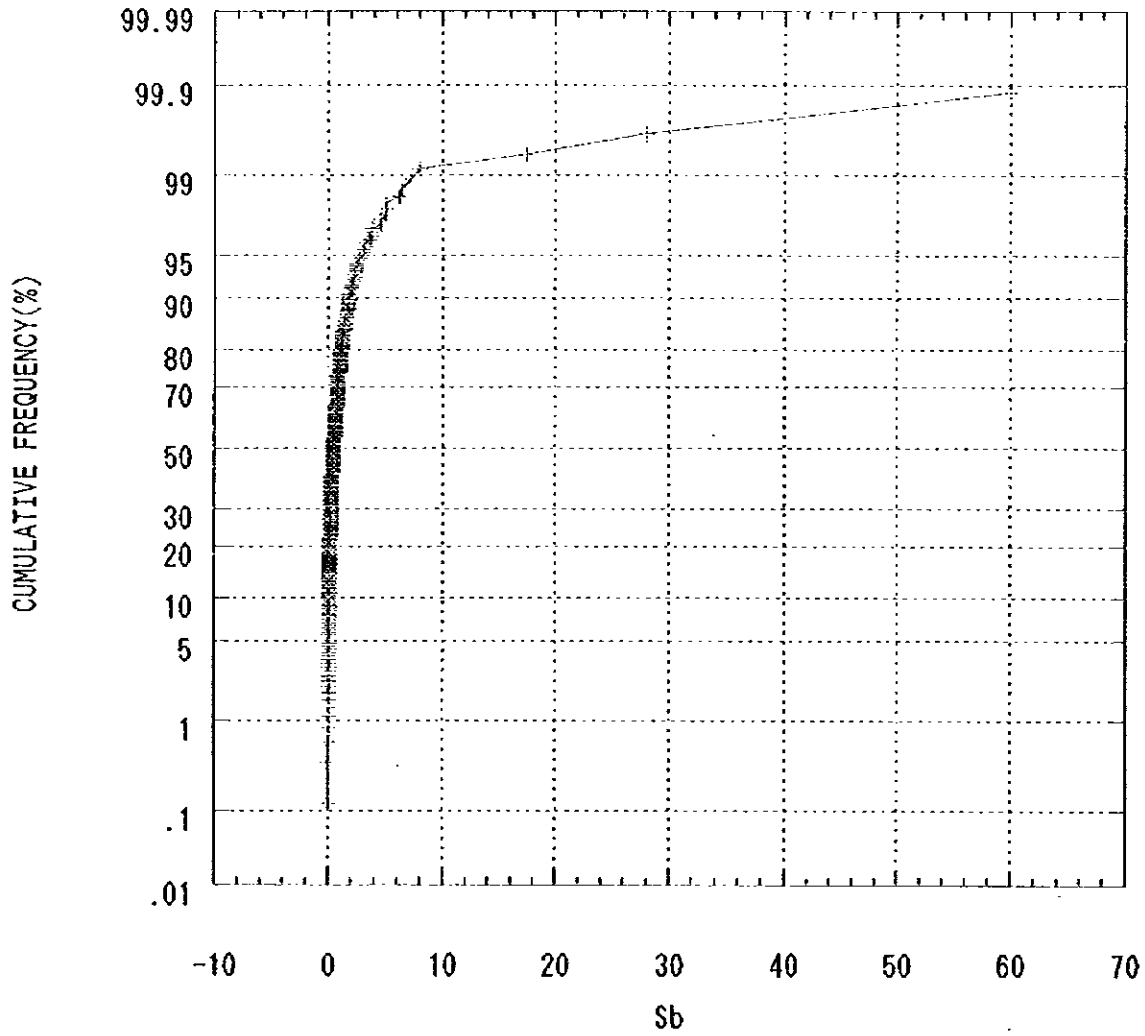


Appendix 5 (4) Cumulative frequency distribution (As)

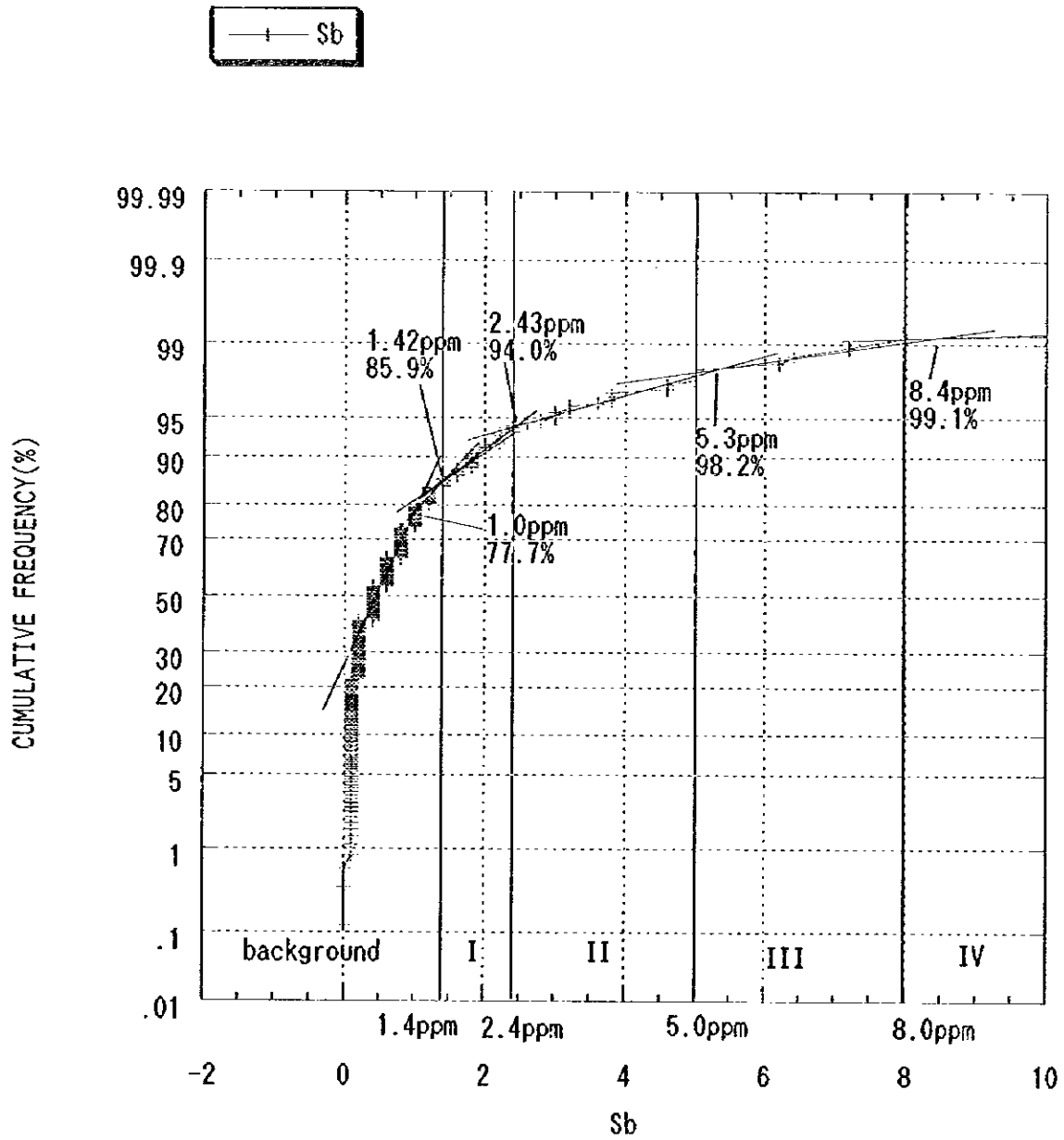


Appendix 5 (5) Cumulative frequency distribution (Sb)

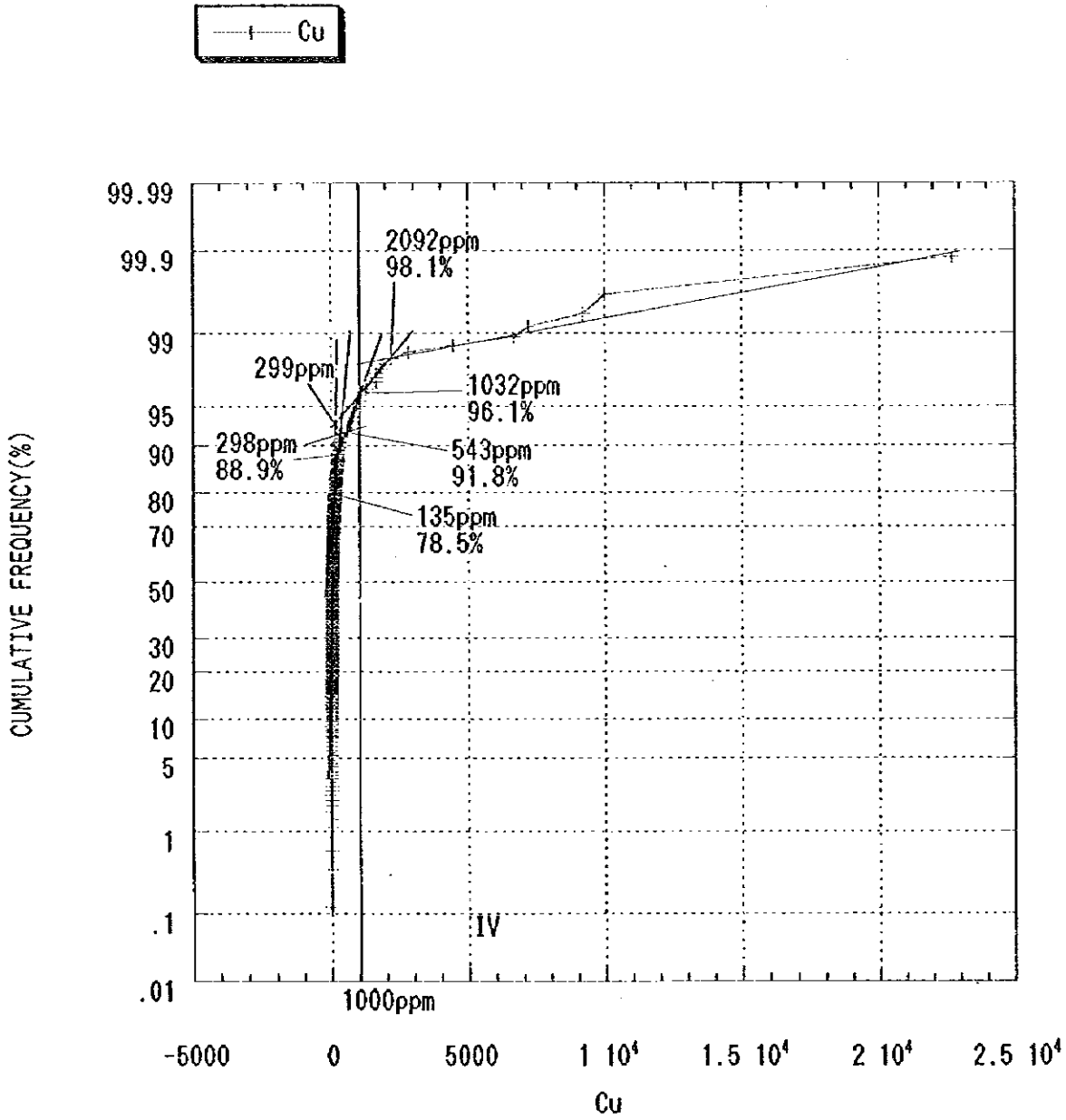
—+— Sb



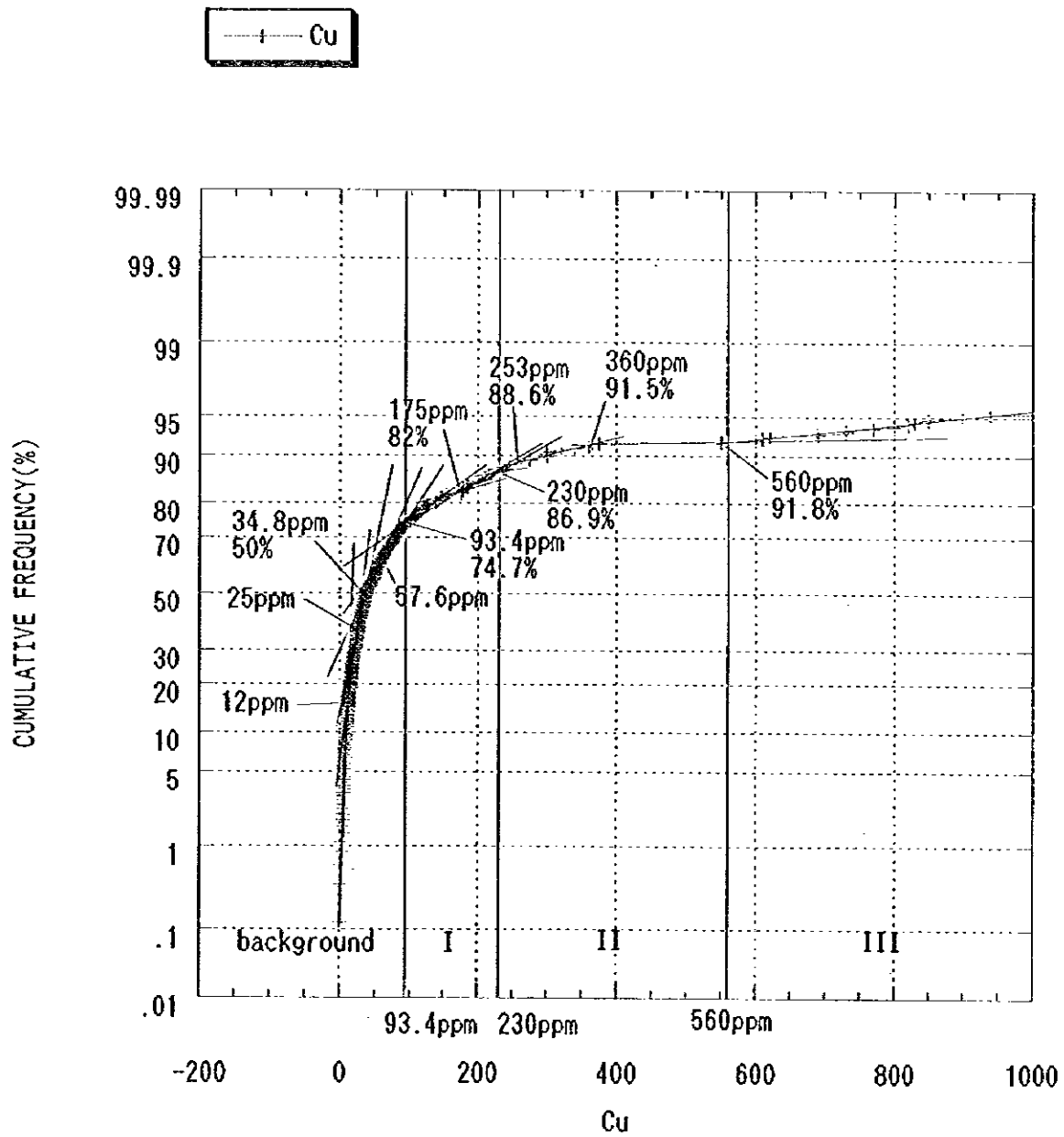
Appendix 5 (6) Cumulative frequency distribution (Sb)



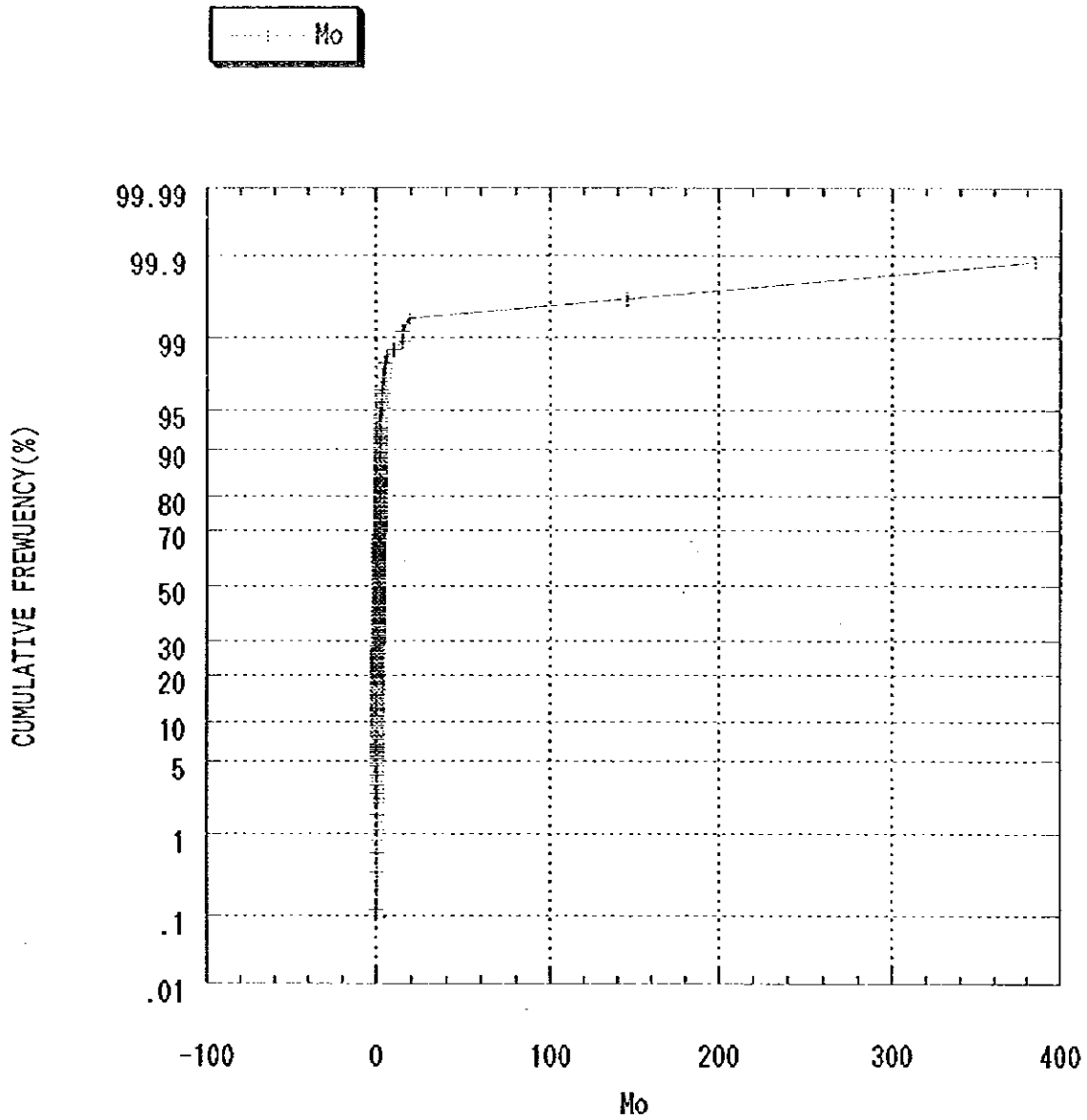
Appendix 5 (7) Cumulative frequency distribution (Cu)



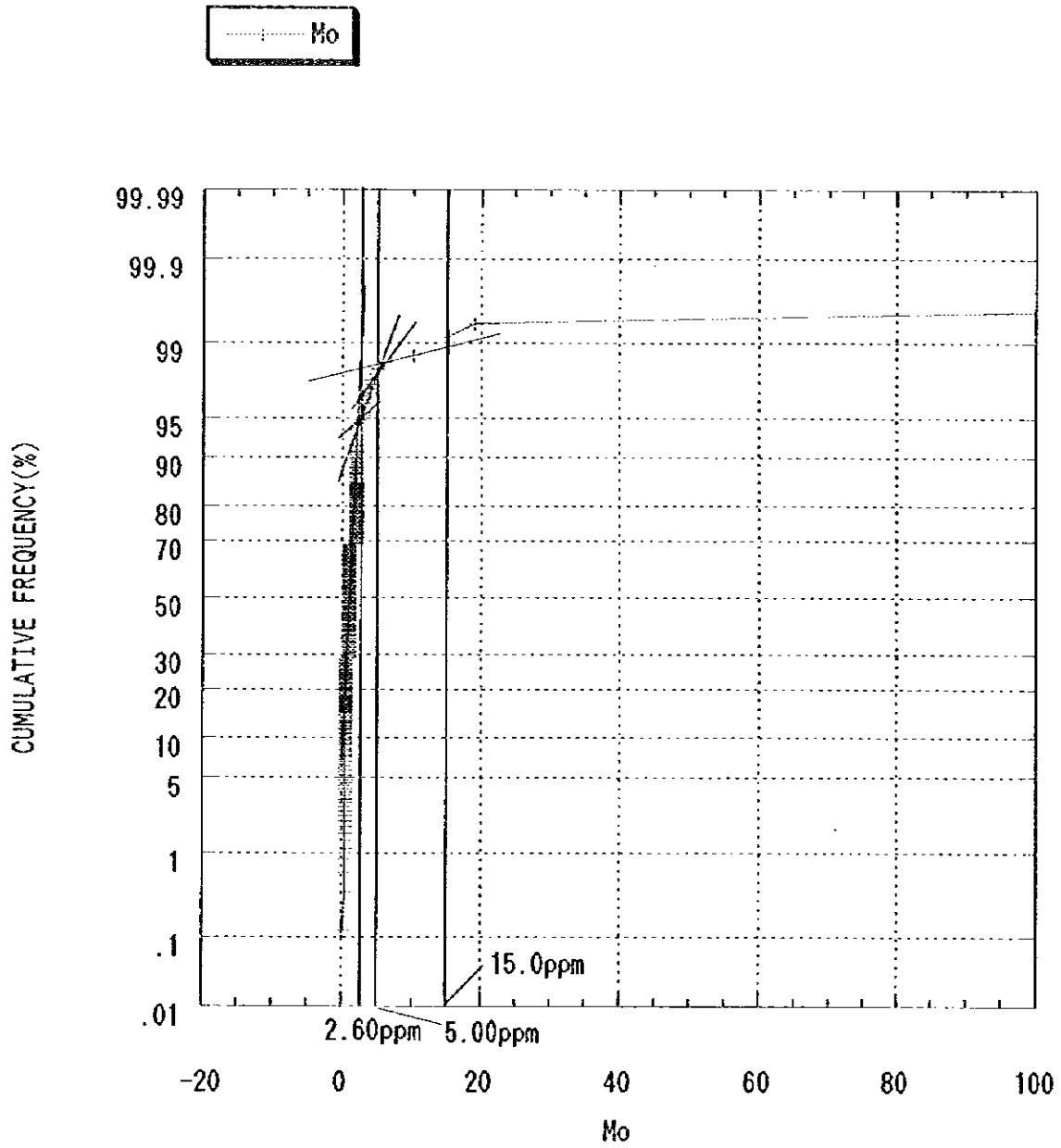
Appendix 5 (8) Cumulative frequency distribution (Cu,



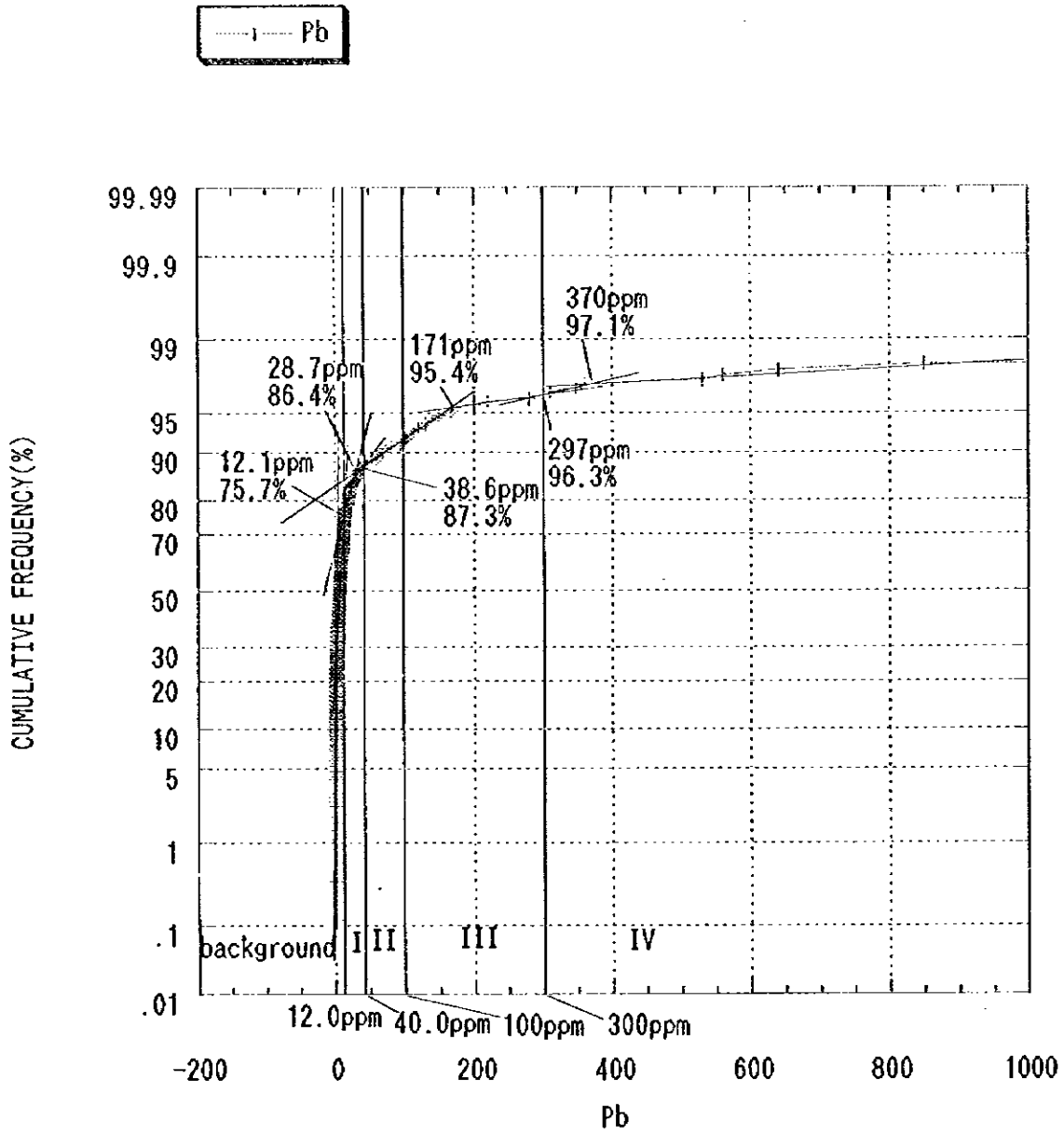
Appendix 5 (9) Cumulative frequency distribution (Mo)



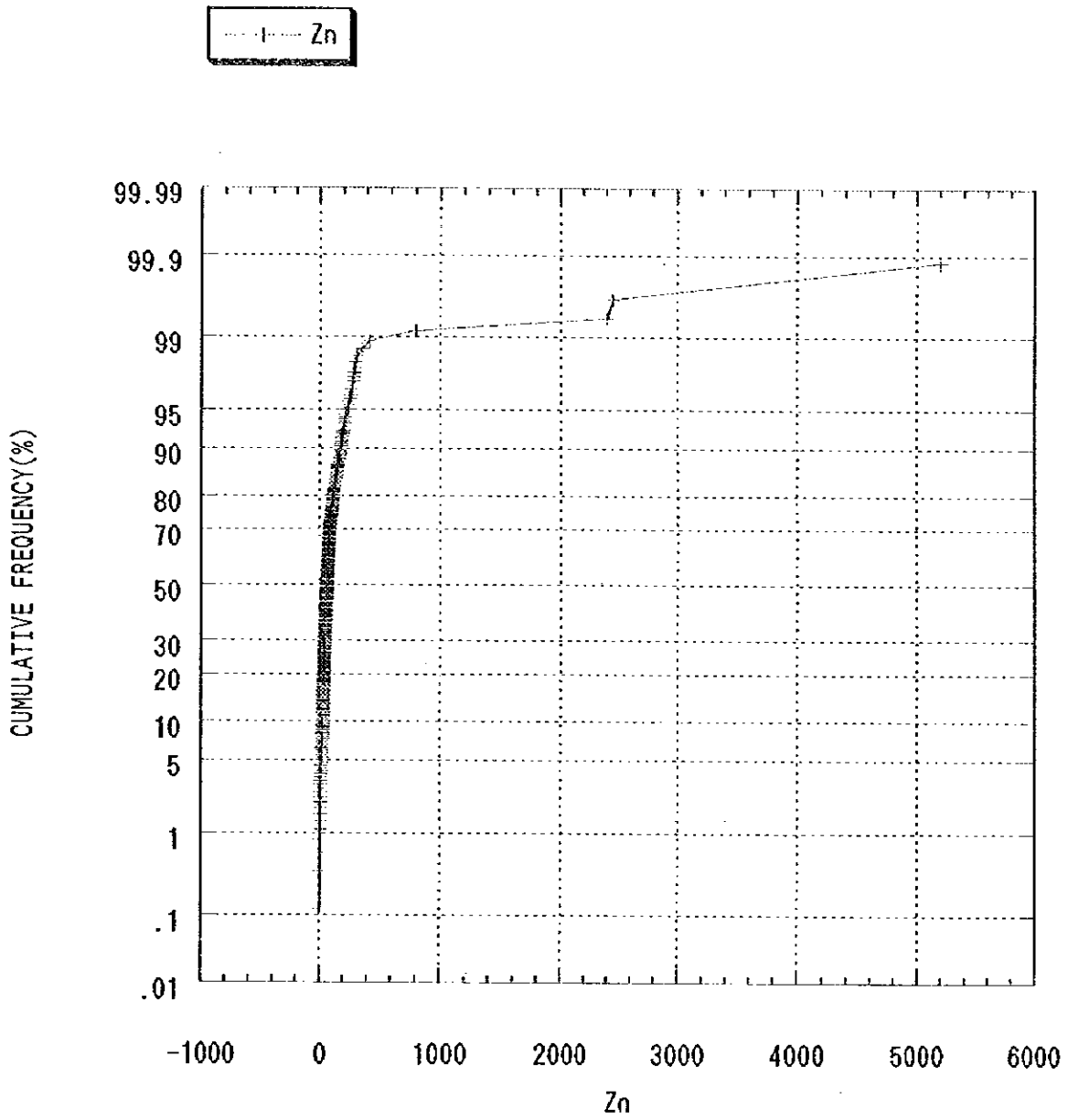
Appendix 5 (10) Cumulative frequency distribution (Mo)



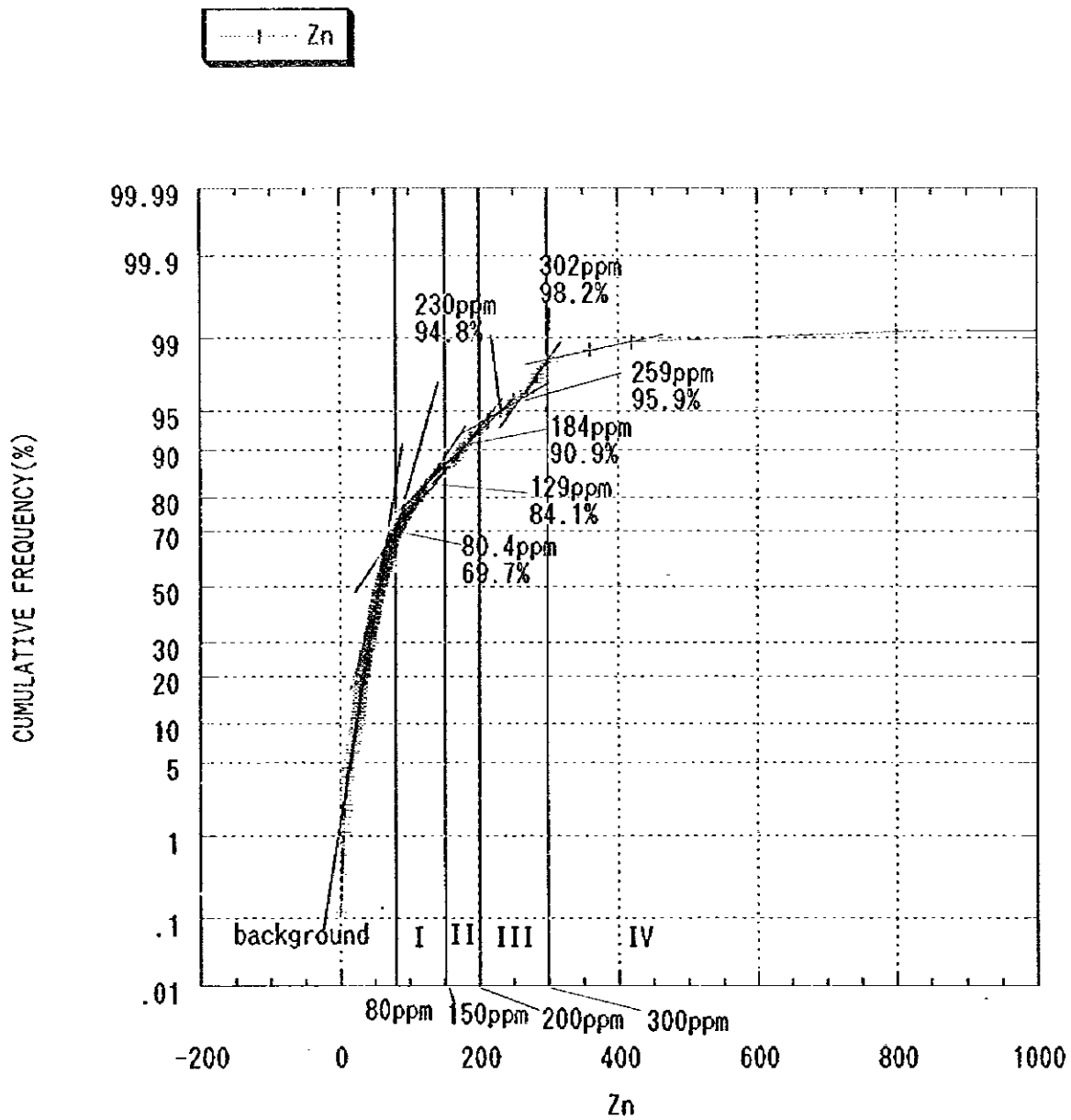
Appendix 5 (11) Cumulative frequency distribution (Pb)



Appendix 5 (12) Cumulative frequency distribution (Zn)



Appendix 5 (13) Cumulative frequency distribution (Zn)



Appendix 6 Criteria for the assignment of symbols to X-ray diffraction analysis

X-ray attached sheet is made by following standard of X-ray relative strength

mineral (d number)	peak height from background (dimension: chart divisions)			
	◎ : (much)	○ : (middle)	△ : (little)	· : (trace)
Quartz (3.34)				
crystalite (4.05)	100 <	99 ~ 50	49 ~ 10	< 10
trydimite (4.27)				
feldsper (3.17)	40 <	39 ~ 20	19 ~ 10	< 9
k-feldsper (3.3)	20 <	19 ~ 10	9 ~ 5	< 5
albite (3.2)				
sericite (10.1)				
chlorite (7.1)				
smectite (15.15)				
kaolinite (7.18)	20 <	19 ~ 10	9 ~ 5	< 5
pyrophyllite (3.04)				
halloysite (4.42)				
laumontite (9.49)				
clinoptilolite (8.93)	45 <	19 ~ 10	9 ~ 5	< 5
mordenite (3.48)				
heulandite (7.89)				
alunite (2.99)				
natro-alunite (3.08)	20 <	44 ~ 20	19 ~ 10	< 10
jarosite (3.07)				
hornblende (8.4)	20 <	19 ~ 10	9 ~ 5	< 5
augite (3.31)				
pyrite (2.71)				
hematite (2.7)	10 <	9 ~ 5	4 ~ 3	< 3
goethite (4.18)				
siderite (3.52)				

Appendix 7

Results of X-ray powder diffraction analysis

	silicate minerals										sulphate carbonate minerals				other minerals																		
	quartz	tridymite	feldspar	k-feldspar	albite	sericite	chlorite	kaolinite	smectite	biotite	halloysite	S/S	C/S	clinoptilolite	mordenite	laumontite	stibite	hornblende	grosular	epidote	alunite	gypsum	calcite	dolomite	pyrite	hematite	anatase	goethite	chalcantite	cerussite	malmetite		
96102501	⊙																																
96102504	⊙											Δ																					
96102507	⊙											⊙																					
103003	⊙																																
103006	⊙																																
103007	⊙																																
103018	⊙												Δ																				
103005	⊙																																
103036	⊙																																
103035	⊙																																
103001	⊙																																
137931	⊙																																
96102513	⊙																																
96102506	⊙																																
96102801	⊙																																
137912	Δ																																
137945	⊙																																
96102509	⊙																																
137917	⊙																																
96102508	⊙																																
96102512	⊙																																
137568	⊙																																
96102505	⊙																																
103014	⊙																																
103015	⊙																																
103016	⊙																																
103034	⊙																																
137948	⊙																																
96102510	⊙																																
103009	⊙																																
103020	⊙																																

⊙ : much ○ : middle Δ : little • : trace

S/S: sericite-smectite interlayer clay mineral

C/S: chlorite-smectite interlayer clay mineral

	silicate minerals											sulphate minerals				carbonate minerals		other minerals																
	quartz	tridymite	feldspar	albite	sericite	chlorite	kaolinite	smeectite	biotite	halloysite	S/S	C/S	clinoptilolite	mordenite	laumontite	stibbite	hornblende	grossular	epidote	alunite	gypsum	calcite	dolomite	pyrite	hematite	anatase	goethite	chalcanthite	cerussite	mimetite				
103021	○		⊗	⊗	○	○		○									⊗		△															
f-2	⊗		⊗			○													△															
f-4	⊗		⊗			○													△															
o-2	⊗		△			○													△															
c-5	⊗		⊗		○														△															
f-7	⊗		⊗		○														△															
d-3	△		⊗		⊗														△															
e-3	⊗		⊗		⊗														△															
e-8	⊗		⊗		⊗														△															
a-3	○		⊗		⊗														△															
f-5	⊗		⊗		⊗														△															
103002	⊗				⊗														△															
e-2	⊗				⊗														△															
a-5	⊗		⊗		⊗														△															
d-4	⊗		⊗		⊗														△															
103023	⊗		⊗		⊗														△															
c-4	⊗		⊗		⊗														△															
a-4	⊗		⊗		⊗														△															
c-2	⊗		⊗		⊗														△															
d-6	△		⊗		⊗														△															
d-2	△		⊗		⊗														△															
a-2	⊗		⊗		⊗														△															
e-4	⊗		⊗		⊗														△															
f-7	⊗		⊗		⊗														△															
c-3	⊗		⊗		⊗														△															
103013	⊗		⊗		⊗														△															
L-4	⊗		⊗		⊗														△															
f-1	⊗		⊗		⊗														△															
e-6	⊗		⊗		⊗														△															

⊗ : much ○ : middle △ : little · : trace

S/S : sericite-smectite interlayer clay mineral

C/S : chlorite-smectite interlayer clay mineral

	silicate minerals										zeolite					silicate minerals clay minerals					sulphate carbonate minerals					other minerals					
	quartz	crystalite	tridymite	feldspar	albite	sericite	chlorite	kaolinite	smectite	biotite	halloysite	S/S	C/S	clinoptilolite	mordenite	laumontite	stilbite	hornblende	grossular	epidote	alunite	gypsum	calcite	dolomite	pyrite	hematite	anatase	goethite	chalcanthite	cerussite	minette
n-4	⊗			⊗		Δ																									
0-5	⊗			⊗		Δ																									
k-1	⊗			⊗		Δ																									
f-6	⊗			⊗		⊗																									
k-3	⊗			⊗		⊗																									
k-4	⊗			⊗		Δ																									
0-4	⊗			⊗		⊗																									
e-5	⊗			⊗		Δ																									
e-7	⊗			⊗		⊗																									
e-1	⊗			⊗		⊗																									
g-1	⊗			⊗		⊗																									
f-2	⊗			⊗		⊗																									
k-4	⊗			⊗		⊗																									
h-2	⊗			⊗		Δ																									
g-4	⊗			⊗		Δ																									
o-6	Δ			?		⊗																									
n-2	Δ			⊗		⊗																									
n-1	⊗			⊗		Δ																									
k-2	⊗			⊗		⊗																									
h-3	⊗			⊗		⊗																									
h-5	⊗			⊗		⊗																									
h-4	⊗			⊗		⊗																									
l-1	⊗			⊗		⊗																									
f-3	⊗			⊗		⊗																									
l-2	⊗			⊗		Δ																									
l-3	⊗			⊗		⊗																									
0-1	⊗			⊗		⊗																									
X-14	⊗			⊗		⊗																									

⊗ : much ○ : middle Δ : little . : trace

S/S: sericite-smectite interlayer clay mineral

C/S: chlorite-smectite interlayer clay mineral

	silicate minerals											sulphate carbonate minerals				other minerals															
	feldspar			clay minerals					zeolite			others				carbonate minerals				minerals											
	quartz	tridymite	feldspar	albite	sericite	chlorite	kaolinite	smeectite	biotite	halloysite	S/S	C/S	clinophtilolite	mordenite	laumontite	stilbite	hornblende	grossular	epidote	alunite	gypsum	calcite	dolomite	pyrite	hematite	anatase	goethite	chalcanthite	cerussite	minette	
X-18	⊙		⊙																△												
X-20	⊙		⊙																	△											
X-21	⊙		⊙																	△											
X-23	⊙		⊙																	△											
X-3	⊙		⊙																	△											
X-6	⊙		⊙																	△											
X-9	⊙		⊙																	△											
Y-14	⊙		⊙																	△											
Y-16	⊙		⊙																	△											
Y-17	⊙		⊙																	△											
Y-18	⊙		⊙																	△											
Y-21	⊙		⊙																	△											
Y-31	⊙		⊙																	△											
Y-3	⊙		⊙																	△											
Y-5	⊙		⊙																	△											
Y-6	⊙		⊙																	△											
Y-9	⊙		⊙																	△											
2-1	⊙		⊙																	△											
2-2	⊙		⊙																	△											
2-3	⊙		⊙																	△											

⊙ : much ○ : middle △ : little . : trace

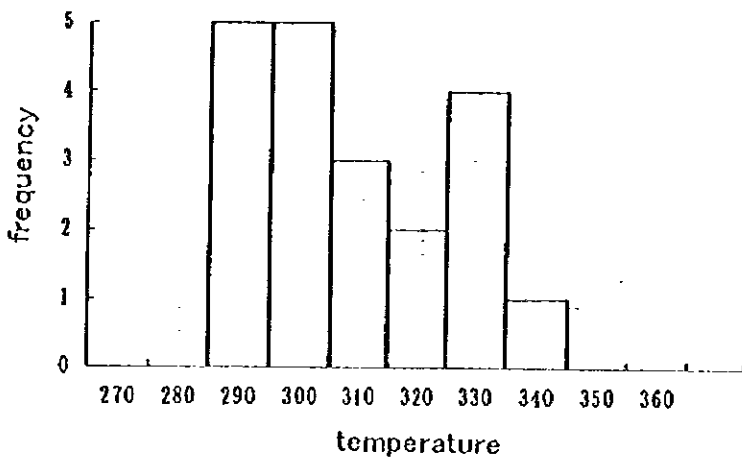
S/S : sericite-smeectite interlayer clay mineral C/S : chlorite-smeectite interlayer clay mineral

Appendix 8(1) Homogenization temperatures and salinities of fluid inclusions (137672)

sample number 137672

No	Mineral	Size (m μ)	Volume ratio (%)	Form	Tempe- rature ($^{\circ}$ C)	Melting Temp ($^{\circ}$ C)	NaCl
1	Quartz	12.5	10	po	323	-7.5	11.10
2	Quartz	10.0	12	po	297	-8.1	11.81
3	Quartz	15.0	12	po	335	-7.9	11.58
4	Quartz	10.0	10	po	310	-7.5	11.10
5	Quartz	5.0	10	po	339	-7.3	10.86
6	Quartz	< 2.5	10	eg	308	-	-
7	Quartz	< 2.5	10	eg	304	-	-
8	Quartz	< 2.5	10	eg	321	-	-
9	Quartz	2.5	12	po	314	-	-
10	Quartz	2.5	12	po	343	-	-
11	Quartz	12.5	12	irr	339	-7.7	11.34
12	Quartz	12.5	12	po	338	-7.8	11.46
13	Quartz	10.0	10	irr	299	-6.2	9.47
14	Quartz	5.0	10	eg	304	-	-
15	Quartz	17.5	12	irr	307	-7.3	10.86
16	Quartz	50.0	12	irr	298	-8.2	11.93
17	Quartz	10.0	10	sq	302	-6.8	10.24
18	Quartz	5.0	10	po	292	-	-
19	Quartz	2.5	10	eg	311	-	-
20	Quartz	< 2.5	10	eg	291	-	-

eg : egg irr : irregular po : polygon sq : square tr : triangle tu : tube wg : wedge

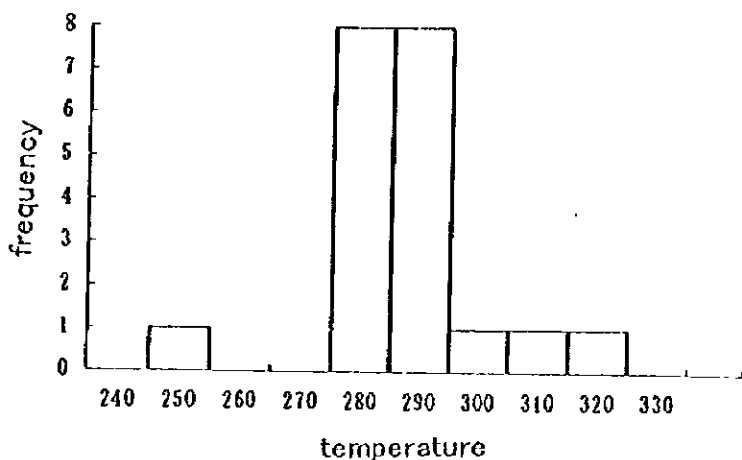


analyzed mineral quartz
 number of Inc. 20
 maximum Th. 343 $^{\circ}$ C
 minimum Th. 291 $^{\circ}$ C
 average Th. 313.8 $^{\circ}$ C
 standard deviation 16.5

Appendix 8 (2) Homogenization temperatures and salinities of fluid inclusions (137532)
 sample number 137532

No	Mineral	Size (m μ)	Volume ratio (%)	Form	Temperature (°C)	Melting Temp (°C)	NaCl
1	Quartz	22.5	15	sq	293	-1.9	3.23
2	Quartz	40.0	12	po	295	-2.0	3.39
3	Quartz	25.0	12	po	298	-1.8	3.06
4	Quartz	22.5	12	po	293	-2.0	3.39
5	Quartz	20.0	12	po	295	-2.1	3.55
6	Quartz	10.0	15	po	291	-2.0	3.39
7	Quartz	50.0	15	po	319	-7.4	10.98
8	Quartz	15.0	12	po	282	-	-
9	Quartz	32.5	12	irr	259	-7.3	10.86
10	Quartz	2.5	10	po	303	-	-
11	Quartz	25.0	12	po	289	-1.5	2.57
12	Quartz	15.0	10	po	291	-2.1	3.55
13	Quartz	30.0	15	po	286	-6.4	9.73
14	Quartz	5.0	12	eg	287	-	-
15	Quartz	2.5	12	eg	288	-	-
16	Quartz	42.5	15	sq	288	-8.5	12.28
17	Quartz	12.5	12	sq	286	-8.6	12.39
18	Quartz	5.0	10	sq	293	-	-
19	Quartz	57.5	12	tu	327	-6.8	10.24
20	Quartz	12.5	7	po	282	-	-

eg : egg irr : irregular po : polygon sq : square tr : triangle tu : tube wg : wedge



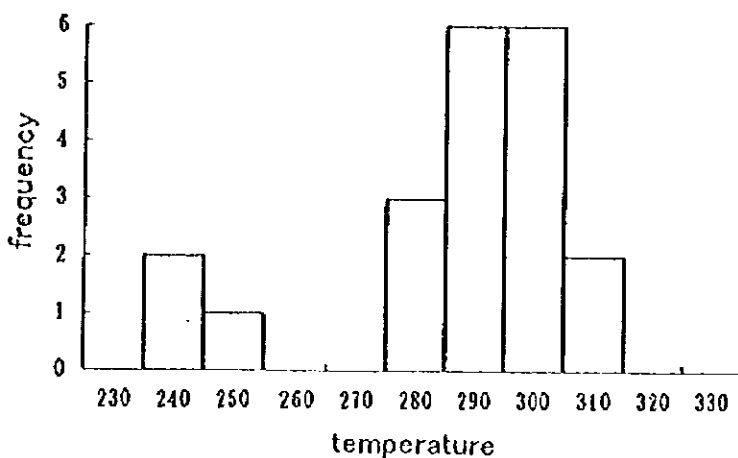
analyzed mineral quartz
 number of Inc. 20
 maximum Th. 327 °C
 minimum Th. 259 °C
 average Th. 292.3 °C
 standard deviation 13.3

Appendix 8 (3) Homogenization temperatures and salinities of fluid inclusions (J)

sample number J

No	Mineral	Size (m μ)	Volume ratio (%)	Form	Tempe- rature ($^{\circ}$ C)	Melting Temp ($^{\circ}$ C)	NaCl
1	Quartz	20.0	10	irr	299	-0.2	0.35
2	Quartz	5.0	7	eg	246	-0.1	0.18
3	Quartz	12.5	10	tu	302	-0.1	0.18
4	Quartz	15.0	10	irr	298	-0.1	0.18
5	Quartz	15.0	10	po	297	0.0	0.00
6	Quartz	< 2.5	5	eg	242	-	-
7	Quartz	< 2.5	7	eg	258	-	-
8	Quartz	2.5	10	po	287	-	-
9	Quartz	5.0	10	eg	289	-	-
10	Quartz	5.0	10	eg	293	-	-
11	Quartz	< 2.5	7	eg	308	-	-
12	Quartz	2.5	10	eg	300	-	-
13	Quartz	5.0	10	eg	303	-	-
14	Quartz	< 2.5	10	eg	308	-	-
15	Quartz	< 2.5	10	eg	314	-	-
16	Quartz	10.0	10	tu	307	-0.1	0.18
17	Quartz	15.0	10	po	311	0.0	0.00
18	Quartz	12.5	10	irr	296	-	-
19	Quartz	2.5	10	eg	285	0.0	0.00
20	Quartz	12.5	10	irr	298	-0.1	0.18

eg : egg irr : irregular po : polygon sq : square tr : triangle tu : tube wg : wedge



analyzed mineral quartz

number of Inc. 20

maximum Th. 314 $^{\circ}$ C

minimum Th. 242 $^{\circ}$ C

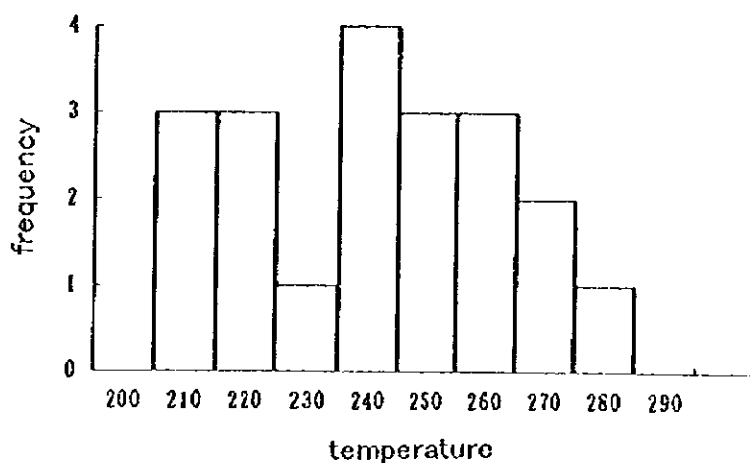
average Th. 292.1 $^{\circ}$ C

standard deviation 19.9

Appendix 8(4) Homogenization temperatures and salinities of fluid inclusions (f-3)
sample number f-3

No	Mineral	Size (m μ)	Volume ratio (%)	Form	Tempe- rature ($^{\circ}$ C)	Melting Temp ($^{\circ}$ C)	NaCl
1	Quartz	77.5	12	irr	255	-2.6	4.34
2	Quartz	12.5	10	po	208	-3.2	5.26
3	Quartz	7.5	10	tu	218	-	-
4	Quartz	47.5	12	irr	269	-7.2	10.73
5	Quartz	30.0	10	irr	216	-6.8	10.24
6	Quartz	12.5	10	irr	236	-6.8	10.24
7	Quartz	20.0	7	irr	229	-6.9	10.36
8	Quartz	10.0	10	irr	237	-	-
9	Quartz	20.0	7	wg	207	-6.3	9.60
10	Quartz	7.5	10	sq	212	-2.6	4.34
11	Quartz	20.0	15	po	251	-2.7	4.49
12	Quartz	22.5	5	tu	204	-2.6	4.34
13	Quartz	5.0	10	irr	238	-	-
14	Quartz	12.5	5	tu	243	-2.6	4.34
15	Quartz	12.5	12	po	277	-	-
16	Quartz	15.0	15	po	263	-2.7	4.49
17	Quartz	12.5	15	po	256	-2.6	4.34
18	Quartz	20.0	20	po	238	-2.6	4.34
19	Quartz	7.5	15	po	248	-	-
20	Quartz	5.0	10	eg	242	-	-

eg : egg irr : irregular po : polygon sq : square tr : triangle tu : tube wg : wedge



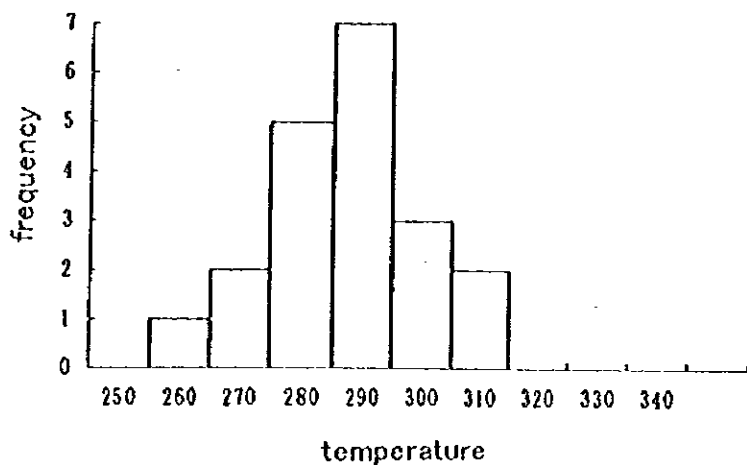
analyzed mineral quartz
 number of Inc. 20
 maximum Th. 277 $^{\circ}$ C
 minimum Th. 204 $^{\circ}$ C
 average Th. 237.4 $^{\circ}$ C
 standard deviation 20.8

Appendix 8 (5) Homogenization temperatures and salinities of fluid inclusions (I-2)

sample number I-2

No	Mineral	Size (m μ)	Volume ratio (%)	Form	Tempe- rature (°C)	Melting Temp (°C)	NaCl
1	Quartz	30.0	12	po	299	-0.1	0.18
2	Quartz	22.5	15	po	291	-0.1	0.18
3	Quartz	15.0	13	po	297	0.0	0.00
4	Quartz	50.0	15	irr	285	-0.1	0.18
5	Quartz	15.0	10	po	283	0.0	0.00
6	Quartz	15.0	10	sq	271	0.0	0.00
7	Quartz	2.5	10	eg	313	-	-
8	Quartz	5.0	10	po	305	-	-
9	Quartz	27.5	12	tr	293	0.0	0.00
10	Quartz	37.5	15	irr	308	-0.1	0.18
11	Quartz	5.0	7	po	297	-	-
12	Quartz	5.0	7	po	288	-	-
13	Quartz	10.0	12	sq	291	0.0	0.00
14	Quartz	17.5	10	irr	283	-0.5	0.88
15	Quartz	17.5	10	po	291	-0.1	0.18
16	Quartz	12.5	12	po	276	-0.1	0.18
17	Quartz	22.5	12	po	267	0.0	0.00
18	Quartz	20.0	12	po	286	-0.1	0.18
19	Quartz	5.0	10	po	306	-	-
20	Quartz	2.5	10	eg	313	-	-

eg : egg irr : irregular po : polygon sq : square tr : triangle tu : tube wg : wedge

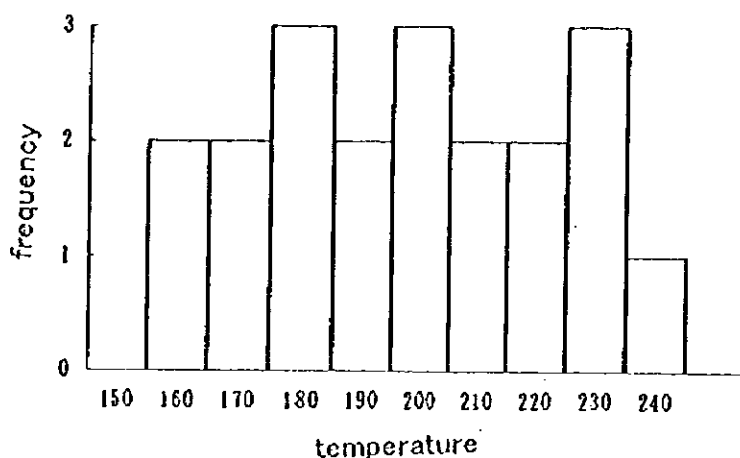


analyzed mineral quartz
 number of Inc. 20
 maximum Th. 313 °C
 minimum Th. 267 °C
 average Th. 292.2 °C
 standard deviation 12.6

Appendix 8 (6) Homogenization temperatures and salinities of fluid inclusions (207)
sample number 207

No	Mineral	Size (m μ)	Volume ratio (%)	Form	Tempe- rature ($^{\circ}$ C)	Melting Temp ($^{\circ}$ C)	NaCl
1	Quartz	22.5	13	irr	245	-1.3	2.24
2	Quartz	27.5	12	po	235	-0.9	1.57
3	Quartz	15.0	7	irr	229	-1.0	1.74
4	Quartz	7.5	10	eg	232	-	-
5	Quartz	5.0	5	tu	237	-	-
6	Quartz	5.0	7	po	195	-	-
7	Quartz	5.0	3	po	185	-	-
8	Quartz	2.5	3	po	183	-	-
9	Quartz	37.5	12	irr	192	-0.9	1.57
10	Quartz	20.0	10	irr	163	-1.0	1.74
11	Quartz	2.5	3	eg	205	-	-
12	Quartz	10.0	7	irr	178	-0.8	1.40
13	Quartz	12.5	7	irr	185	-1.0	1.74
14	Quartz	22.5	5	irr	177	-1.2	2.07
15	Quartz	17.5	3	po	165	-1.1	1.91
16	Quartz	7.5	10	po	205	-1.0	1.74
17	Quartz	15.0	10	irr	217	-	-
18	Quartz	5.0	10	po	214	-	-
19	Quartz	5.0	7	po	205	-	-
20	Quartz	2.5	5	eg	223	-	-

eg : egg irr : irregular po : polygon sq : square tr : triangle tu : tube wg : wedge

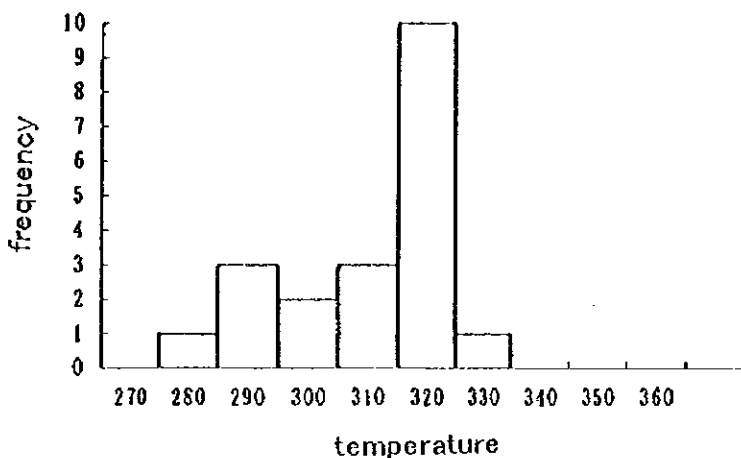


analyzed mineral quartz
 number of Inc. 20
 maximum Th. 245 $^{\circ}$ C
 minimum Th. 163 $^{\circ}$ C
 average Th. 203.5 $^{\circ}$ C
 standard deviation 24.3

Appendix 8 (7) Homogenization temperatures and salinities of fluid inclusions (137572)
 sample number 137572

No	Mineral	Size (m μ)	Volume ratio (%)	Form	Tempe- rature (°C)	Melting Temp (°C)	NaCl
1	Quartz	12.5	12	tr	325	-0.9	1.57
2	Quartz	7.5	12	po	324	-0.6	1.05
3	Quartz	2.5	10	eg	296	-	-
4	Quartz	2.5	10	eg	308	-	-
5	Quartz	5.0	12	eg	323	-	-
6	Quartz	< 2.5	10	eg	315	-	-
7	Quartz	< 2.5	12	eg	321	-	-
8	Quartz	2.5	12	eg	322	-	-
9	Quartz	15.0	15	po	324	-0.6	1.05
10	Quartz	12.5	12	po	316	-0.6	1.05
11	Quartz	5.0	10	po	321	-	-
12	Quartz	20.0	10	po	329	-0.5	0.88
13	Quartz	10.0	10	po	327	-	-
14	Quartz	15.0	15	irr	333	-0.9	1.57
15	Quartz	2.5	10	eg	308	-	-
16	Quartz	< 2.5	5	eg	286	-	-
17	Quartz	< 2.5	5	eg	297	-	-
18	Quartz	10.0	10	po	321	-0.8	1.40
19	Quartz	2.5	7	eg	296	-	-
20	Quartz	2.5	10	eg	315	-	-

eg : egg irr : irregular po : polygon sq : square tr : triangle tu : tube wg : wedge



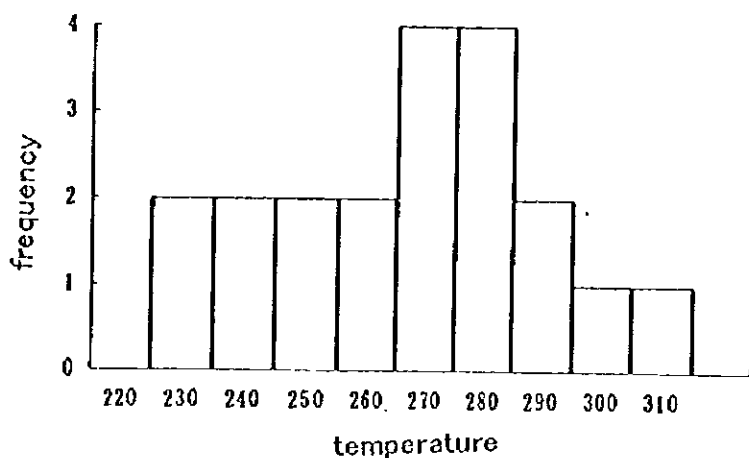
analyzed mineral quartz
 number of Inc. 20
 maximum Th. 333 °C
 minimum Th. 286 °C
 average Th. 315.4 °C
 standard deviation 12.5

Appendix 8 (8) Homogenization temperatures and salinities of fluid inclusions (137887)

sample number 137887

No	Mineral	Size (m μ)	Volume ratio (%)	Form	Temperature ($^{\circ}$ C)	Melting Temp ($^{\circ}$ C)	NaCl
1	Quartz	15.0	10	eg	253	-0.8	1.40
2	Quartz	12.5	10	eg	266	-0.7	1.23
3	Quartz	7.5	10	tr	277	-0.7	1.23
4	Quartz	20.0	7	sq	259	-0.8	1.40
5	Quartz	10.0	7	irr	241	-0.7	1.23
6	Quartz	10.0	5	sq	232	-0.7	1.23
7	Quartz	12.5	12	eg	283	-0.5	0.88
8	Quartz	7.5	10	po	272	-0.6	1.05
9	Quartz	7.5	12	sq	286	-0.5	0.88
10	Quartz	5.0	10	sq	274	-	-
11	Quartz	5.0	10	sq	268	-	-
12	Quartz	12.5	12	eg	309	-0.7	1.23
13	Quartz	15.0	10	eg	277	-1.1	1.91
14	Quartz	5.0	12	po	297	-	-
15	Quartz	5.0	5	eg	238	-	-
16	Quartz	< 2.5	5	eg	288	-	-
17	Quartz	12.5	15	po	318	-0.1	0.18
18	Quartz	20.0	12	irr	246	-0.6	1.05
19	Quartz	5.0	10	po	293	-	-
20	Quartz	5.0	10	tu	287	-	-

eg : egg irr : irregular po : polygon sq : square tr : triangle tu : tube wg : wedge



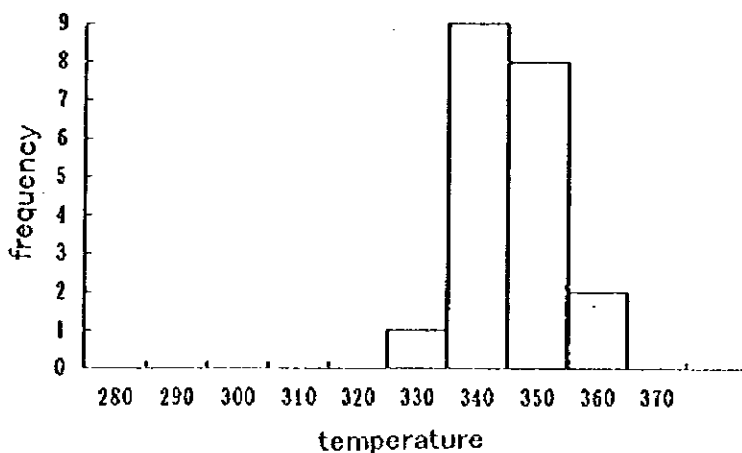
analyzed mineral quartz
 number of Inc. 20
 maximum Th. 318 $^{\circ}$ C
 minimum Th. 232 $^{\circ}$ C
 average Th. 273.2 $^{\circ}$ C
 standard deviation 22.7

Appendix 8 (9) Homogenization temperatures and salinities of fluid inclusions (137803)

sample number 137803

No	Mineral	Size (m μ)	Volume ratio (%)	Form	Tempe- rature ($^{\circ}$ C)	Melting Temp ($^{\circ}$ C)	NaCl
1	Quartz	12.5	12	po	352	-0.1	0.18
2	Quartz	27.5	15	po	357	-0.1	0.18
3	Quartz	17.5	15	po	356	-0.1	0.18
4	Quartz	20.0	15	po	358	0.0	0.00
5	Quartz	27.5	12	irr	359	-0.1	0.18
6	Quartz	30.0	15	po	349	-0.2	0.35
7	Quartz	10.0	15	po	348	-0.1	0.18
8	Quartz	< 2.5	10	eg	339	-	-
9	Quartz	< 2.5	10	eg	341	-	-
10	Quartz	7.5	15	po	352	-	-
11	Quartz	2.5	10	eg	349	-	-
12	Quartz	37.5	15	po	348	-0.1	0.18
13	Quartz	20.0	15	sq	346	-0.1	0.18
14	Quartz	7.5	15	eg	344	-	-
15	Quartz	5.0	12	eg	351	-	-
16	Quartz	20.0	17	irr	367	-0.1	0.18
17	Quartz	12.5	12	eg	364	0.0	0.00
18	Quartz	5.0	10	eg	343	-	-
19	Quartz	5.0	12	po	352	-	-
20	Quartz	2.5	10	po	342	-	-

eg : egg irr : irregular po : polygon sq : square tr : triangle tu : tube wg : wedge



analyzed mineral quartz
 number of Inc. 20
 maximum Th. 367 $^{\circ}$ C
 minimum Th. 339 $^{\circ}$ C
 average Th. 350.9 $^{\circ}$ C
 standard deviation 7.4