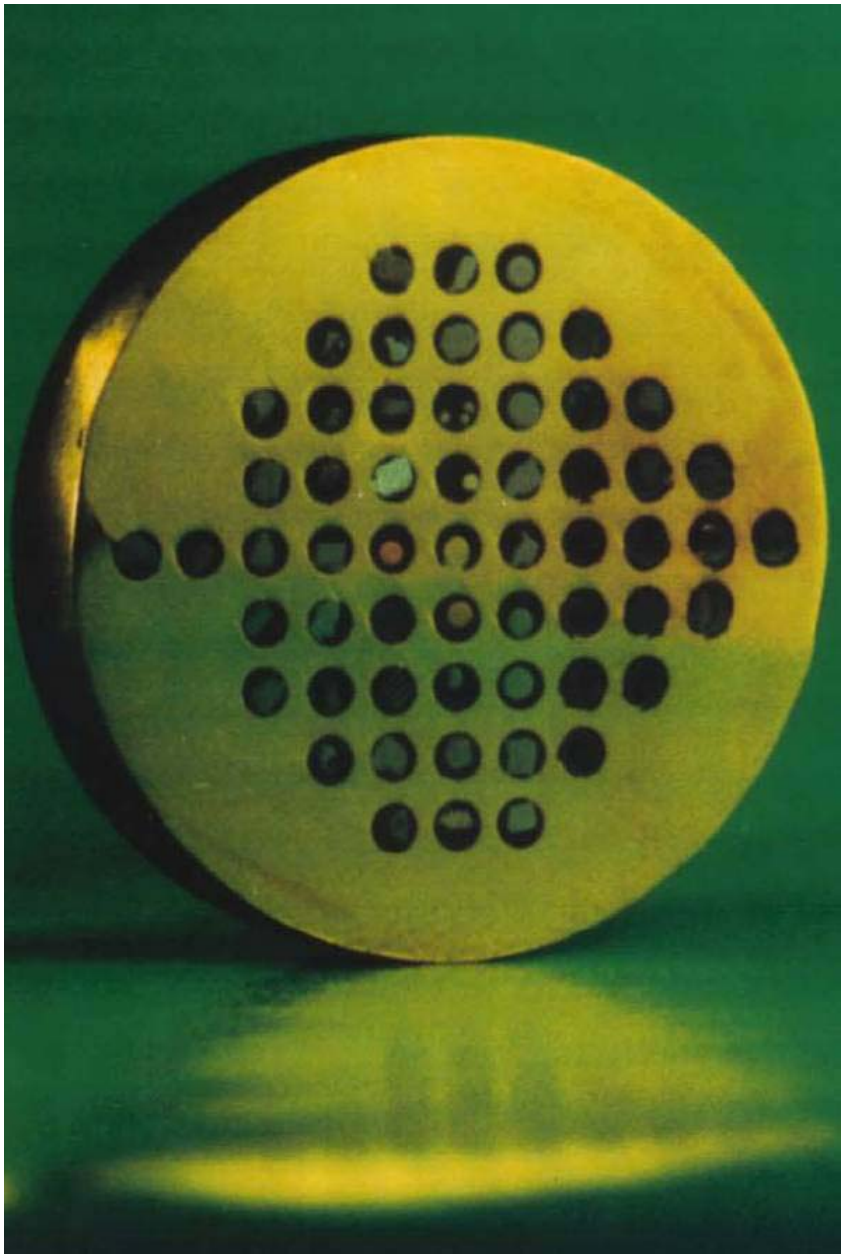
ANSTAND
Standard Reference Materials

US UNIVERSAL SET



Reference Material For X-Ray Electron Microanalysis

Distribuito in Italia da

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REFERENCE MATERIALS FOR
X-RAY ELECTRON MICROANALYSIS

UNIVERSAL MICRO SAMPLE US 57

This sample of 57 individual reference materials has been designed for quality assurance of microanalysis in metallurgy, geology, ceramic and buildings materials industry and environmental monitoring. US 57 serves as a reliable reference material for parameter setting, peak identification and calibration of ED- and WD-spectrometers in electron microanalysis.

The micro reference sample US 57 represents a balanced combination of pure elements, carbon steels, low alloy steels, tool- and high speed steels, stainless steels, blast furnace irons, ferro alloys, sintered carbides, various minerals, glass and HF-slag in a single mount.

CERTIFICATE
UNIVERSAL MICRO SAMPLE US 57-1

The individual materials are mounted in 1.5 mm diameter holes fixed by a high vacuum proof cold setting resin system in a brass block of 5 mm thickness and diameter of either 25 or 32 mm. The sample surface is diamond polished, the nonconductive materials are carbon coated. A Faraday cup of 0.15 mm diameter and 3 mm depth is available on request.

The concentrations stated are based on at least two independent laboratory means, obtained by different analytical techniques or taken from the certificate of the particular reference material used. The candidate materials were carefully selected and tested for homogeneity. With those materials heterogeneous by nature (marked with an asterix in the attached tables) the user is recommended to find the essential parts prior to exication. The

values of element concentration were achieved applying the ISO-REMCO GUIDE 35-1985 (E), thus the uncertainty of values, based on residual systematic error is expressed by the last significant digit as per above cited document i.e. 58.4 wt% means a concentration of 58.3 to 58.5 wt%.
This MICRO SAMPLE US 57 should always be handled with great care, it should not be touched or wiped, because it is easily scratched. Use a gentle stream of dry air to remove any dust. Keep the sample in a dry atmosphere, preferably in a dessicator.

This certificate comprises the following information and data:

- map of specific US 57 and magnified photo for easier identification of individual reference sample;
- list of the 57 individual reference samples;
- composition of the individual reference samples;
- alphabetic table of available element concentrations in ascending order for quick selection of suitable individual sample.

Manufactured and certified by: **ANSTAND COMPANY, Pjanovova 35**
0400 OSTRAVA 3, CSFR

Marketing and distribution
in Italy by:

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STOCK LIST OF REFERENCE MATERIALS
FOR CUSTOMER SELECTION

to be mounted in MICRO-samples for X-ray electron microanalysis

Item	**Reference Mat.**		**Symbol**	**Concentration %**
1	carbon		C	C 99.9
2	magnesium		Mg	Mg 99.9
3	aluminium		Al	Al 99.9
4	silicon		Si	Si 99.9
5	titanium		Ti	Ti 99.9
6	vanadium		V	V 99.9
7	chromium		Cr	Cr 99.9
8	manganese		Mn	Mn 99.9
9	iron		Fe	Fe 99.9
10	cobalt		Co	Co 99.9
11	nickel		Ni	Ni 99.9
12	copper		Cu	Cu 99.9

13	zinc		Zn	Zn 99.9
14	gallium		Ga	Ga 99.9
15	germanium		Ge	Ge 99.9
16	selenium		Se	Se 99.9
17	zirconium		Zr	Zr 99.9
18	niobium		Nb	Nb 99.9
19	molybdenum		Mo	Mo 99.9
20	silver		Ag	Ag 99.9
21	cadmium		Cd	Cd 99.9
22	antimony		Sb	Sb 99.9
23	tellurium		Te	Te 99.9
24	hafnium		Hf	Hf 99.9
25	tantalum		Ta	Ta 99.9
26	tungsten		W	W 99.9

27	lead		Pb	Pb 99.9
28	bismuth		Bi	Bi 99.9
29	carbon steel		OC 54	C 0.55 S 0.010 Mn 0.60 Fe 98
30	carbon steel		OC 70	C 0.74 S 0.016 Mn 0.52 Fe 98
31	carbon steel		OC 84	C 0.83 S 0.015 Mn 0.45 Fe 98
32	low alloy steel		16270	C 0.66 Si 0.21 P 0.019 S 0.011 Cr 0.33 Mn 0.43 Ni 1.8 Cu 0.05 Fe 96
33	Cr-steel		1Cr17	C 0.05 Si 0.40 S 0.016 Cr 16.3 Mn 0.42 Ni 0.15 Fe 82

34	kanthal		1Cr21Al7	C 0.03 Al 6.9 Si 0.57 Cr 21.4 Mn 0.30 Ni 0.09 Mo 0.03 Fe 70
35	stainless steel		1Cr18Ni10Mo	C 0.05 Si 0.32 S 0.018 Cr 18.5 Mn 0.91 Ni 9.9 Mo 2.3 Fe 67
36	stainless steel		1Cr18Ni10	C 0.04 Si 0.45 S 0.016 Cr 17.6 Mn 1.11 Ni 9.8 Fe 70
37	stainless steel		1Cr23Ni14	C 0.05 Si 0.46 S 0.007 Cr 23.5 Mn 1.61 Ni 13.7 Fe 60
38	high speed steel		19857	C 0.96 Si 0.25 P 0.015 S 0.022 V 2.3 Cr 4.1 Mn 0.17 Co 10.5

				Mo 0.03 W 9.5 Fe 72
39	tool steel		1920B	C 1.40 S 0.017 V 5.7 Cr 4.7 Mn 0.35 Co 5.0 Mo 0.12 W 14.3 Fe 70
40	cast iron	*	425092	C 4.1 Si 1.6 P 0.24 S 0.019 Mn 1.3 Fe 92
41	cast iron	*	CKD 239	C 4.2 Mn 0.76 Si 0.27 P 0.024 S 0.018 Cr 0.052 Ni 2.42 Cu 0.085 Fe 92
42	pig iron	*	417111	C 4.1 Si 2.3 P 0.18 S 0.009 Cr 0.05 Mn 1.02 Fe 91
43	pig iron	*	106074	C 4.7

				S 0.024 Mn 0.60 Cr 0.18 Fe 94
44	pig iron	*	120032	C 4.3 Si 0.48 S 0.034 Cr 0.14 Mn 0.60 Zn 0.02 Fe 94
45	pig iron	*	414022	C 4.5 Si 1.05 P 0.26 S 0.018 Mn 1.02 Fe 93
46	ferro-alloy	*	FeBNd	B 1.24 Al 0.13 Si 0.05 Cr 0.03 Mn 0.03 Pr 0.3 Nd 31.2 Fe 66
47	ferro-alloy	*	FeAl	C 0.03 Mg 0.2 Al 48 Si 1.4 Fe 49
48	ferro-alloy	*	FeSi	Al 0.5 Si 46 Mn 0.4 Fe 53

50	ferro-alloy	*	FeV	Al 4.4 Si 0.7 V 79 Fe 16
51	ferro-alloy	*	FeCr	C 0.45 Si 1.2 Cr 68 Fe 30
52	ferro-alloy	*	FeMn	C 7.2 Si 1.5 P 1.2 Mn 82 Fe 9
53	ferro-alloy	*	FeMo	Fe 62 Mo 38
54	Ti-alloy		BR Ti5	Al 6.8 Ti 89 Fe 0.08 Mo 4.0
55	Ni-alloy		Ni90Cr10	Si 0.3 Cr 9.5 Mn 0.04 Ni 89
56	constantan		Cu55Ni45	Mn 1.3 Ni 43.5 Cu 55.1
57	brass		Cu63Zn37	Fe 0.05 Ni 0.004 Cu 63.7 Zn 36.2

58	Al-bronze		Cu84Al12Fe4	Al 11.6 Fe 3.7 Cu 84
59	P-bronze		Cu90P10	P 10.5 Cu 89
60	Sn-bronze		Cu94Sn6	Cu 94.6 Zn 0.004 Sn 5.3
61	Ag-solder		Ag58Cu28Zn14	Cu 27.9 Zn 13.6 Ag 58.4
62	Ag-alloy		Ag63Au37	Ag 63 Au 37
64	gallium arsenide		GaAs	Ga 51.2 As 48.8
65	indium phosphide		InP	In 80.3 P 19.7
66	indium antimonide		InSb	In 48.5 Sb 51.5
69	sintered carbides	*	WC/TiC/Co	C 9 Co 6.2 Ti 0.9 W 77
70	sintered carbide	*	WC/Co	C 6 Co 8.8

				W 85
71	boron nitride	p	BN	B 43.6 N 56.4
72	silicon carbide	p	SiC	C 29.9 Si 70.1
73	titan. carbide	p	TiC	C 20.0 Ti 80.0
74	fluorite		CaF_2	Ca 51 F 49
75	jadeite		$NaAlSi_2O_6$	Na 10.9 Al 15.5 Si 23.8 K 1.4 Ca 1.3 Fe 1.2 O 46
76	albite		$NaAlSi_3O_8$	Na 9.4 Al 10.1 Si 31.9 O 48
77	corundum		Al_2O_3	Al 53 O 47
78	topaz		Al_2SiO_4	Al 32.3 Si 18.2 O 49

79	orthoclase		$KAlSi_3O_8$	Na 0.9 Al 9.6 Si 31.6 K 10.8 O 47
80	pyrope		$Mg_3Al_2Si_3O_{12}$	Mg 11.7 Al 11.3 Si 18.7 Ca 2.7 Ti 0.4 Cr 1.0 Fe 9.2 O 44
81	quartz		SiO_2	Si 47 O 53
82	wollastonite		$CaSiO_3$	Si 24 Ca 35 O 41
84	CaTi-oxide	s	$CaTiO_3$	Ca 29.5 Ti 35.2 O 35
85	andradite		$Ca_3Fe_2Si_3O_{12}$	Mg 2.4 Al 5.1 Si 19.5 Ca 20.5 Fe 11.3 O 41
86	rutile		TiO_2	Ti 60 O 40
87	olivine		$MgFeSiO_4$	Mg 27.2

				Si 20.5 Fe 8.5 O 44
88	chromite		$FeCr_2O_4$	Mg 8.5 Al 5.3 Cr 39 Fe 15 O 32
89	hematite	s	Fe_2O_3	Fe 69.9 O 30
90	magnetite		Fe_3O_4	Fe 72 O 26
91	cuprite		Cu_2O	Cu 89 O 11
92	zircon		$ZrSiO_4$	Si 14 Zr 52 O 34
93	rhodochrosite		$MnCO_3$	Mn 48 O 42 C 10
94	magnesite		$MgCO_3$	Mg 26.4 Si 2.9 Ca 2.1 O 54 C 14
95	calcite		$CaCO_3$	Ca 39 O 48 C 12

96	anhydrite		$CaSO_4$	S 22 Ca 32 O 46
97	wolframite		$(Mn, Fe)WO_4$	Mn 8.1 Fe 10.5 W 60 O 21
98	BaTi-oxid	s	$BaTiO_3$	Ba 58.9 Ti 20.5 O 20
99	KTa-oxide	s	$KTaO_3$	K 14.5 Ta 67.5 O 18
100	pyrite		FeS_2	S 53 Fe 47
101	chalcopyrite		$CuFeS_2$	Fe 30.3 Cu 36.0 S 33.7
102	sphalerite		ZnS	S 34 Zn 66
103	antimonite		Sb_2S_3	S 27 Sb 73
104	galenite		PbS	S 7 Pb 93
105	glass		GA-11	Na 1.6

				Al 9.5 Si 20.6 K 1.1 Ca 0.7 Mn 21.2 Zn 4.0 O 41
106	glass		GB-2	Al 2.9 Si 27.5 K 0.3 Ca 14.6 Fe 9.8 Ni 0.3 Cu 1.0 Zn 0.5 O 43
107	glass		SD-44	Na 6.4 Mg 8.1 Al 14.2 Si 8.0 P 2.3 Ca 14.9 Fe 0.3 Zn 4.5 Pb 1.8 O 40
108	glass		GSI-V	Na 11.3 Al 1.5 Si 26.1 K 1.8 Ca 4.4 Cr 2.2 Mn 4.3 Zn 3.2 Ba 4.3 O 41
109	glass		FS-23	Al 0.9 Si 32.9

				K 19.0 Ca 2.9 Ti 0.6 O 44
110	BF-slag		VP	Mg 7.7 Al 3.8 Si 19.6 S 0.5 K 0.6 Ca 25.0 Mn 0.8 O 41
111	indium		In	In 99.9
112	tin		Sn	Sn 99.9
113	gold		Au	Au 99.9
114	low alloy steel	ch	5Cr1/2Mo	C 0.13 Si 0.25 Cr 4.3 Mn 0.46 Ni 0.10 Cu 0.13 Mo 0.46 Fe 94
115	low alloy steel	ch	9Cr1Mo	C 0.13 Si 0.38 Cr 8.7 Mn 0.41 Ni 0.24 Cu 0.15 Mo 0.96 Fe 89

116	Cr-steel	ch	AISI 446	C 0.09 Si 0.37 Cr 23.8 Mn 0.46 Ni 0.31 Cu 0.06 Mo 0.05 Fe 74.8
117	stainless steel	ch	AISI 310	C 0.07 Si 0.53 Cr 25.5 Mn 1.7 Ni 20.1 Cu 0.30 Mo 0.15 Fe 51.7
118	stainless steel	ch	AISI 347	C 0.06 Si 0.77 Cr 17.4 Mn 1.5 Ni 9.9 Cu 0.10 Nb 0.70 Mo 0.17 Fe 69.4
119	stainless steel	ch	Nitronic 40	C 0.04 Si 0.64 Cr 20.2 Mn 9.5 Ni 6.6 Cu 0.43 Mo 0.12 Fe 62.5
120	stainless steel	ch	Nitronic 50	C 0.05 Si 0.56 Cr 21.2 Ni 11.9 Cu 0.38

				Nb 0.16 Mo 2.2 Fe 58.9
121	stainless steel	ch	Nitronic 60	C 0.08 Si 4.1 Cr 16.4 Mn 8.2 Ni 8.2 Cu 0.40 Mo 0.23 Fe 62.4
122	stainless steel	ch	17-4-PH	C 0.05 Si 0.51 Cr 15.51 Mn 0.52 Ni 4.4 Cu 3.2 Nb 0.28 Mo 0.10 Fe 75.5
123	stainless steel	ch	Invar 36	C 0.06 Si 0.27 Cr 0.17 Mn 0.76 Ni 36.1 Cu 0.08 Mo 0.01 Ta 0.18 Fe 62.4
124	stainless steel	ch	Carp20CB3	C 0.2 Si 0.32 Cr 19.6 Ni 33.6 Mn 0.48 Cu 3.2 Co 0.27 Nb 0.51 Mo 2.1

				Ta 0.21 Fe 39.6
125	stainless steel	ch	Haynes 556	C 0.11 Si 0.45 Cr 21.8 Mn 1.00 Co 17.7 Ni 20.2 Cu 0.09 Mo 2.9 W 2.4 Fe 33.4
126	stainless steel	ch	Maraging 300	C 0.01 Si 0.03 Ti 0.62 Cr 0.16 Mn 0.03 Co 8.9 Ni 18.6 Cu 0.03 Mo 4.9 Fe 66.7
127	stainless steel	ch	BCS 467	C 0.069 Mn 0.68 Si 0.45 P 0.015 S 0.019 Ni 8.95 Cr 18.05 Nb 1.06 Fe 70.7
128	stainless steel	ch	NBS 339	C 0.052 Mn 0.738 Si 0.654 S 0.013 Cu 0.199 Ni 8.89 Cr 17.42

				V 0.058 Co 0.096 Mo 0.248 Se 0.247 Fe 71.2
129	stainless steel	ch	NHKG P-10	C 0.09 Mn 0.44 Si 1.38 P 0.022 Ni 10.51 Cr 17.34 Ti 0.84 Fe 69.3
130	stainless steel	ch	IMZ 1.12	C 0.085 Mn 1.60 Si 0.56 P 0.038 S 0.017 Ni 10.56 Cr 18.63 Mo 2.07 Ti 0.73 Fe 65.7
131	stainless steel	ch	CS 3/4/04	C 0.072 Mn 0.66 Si 0.29 P 0.046 S 0.007 Ni 9.21 Cr 18.05 Cu 0.10 Ti 0.63 Co 0.026 Fe 70.9
132	high speed steel		24/3	C 0.94 Si 0.20 Mn 0.44 S 0.048

				Cu 0.20 Ni 0.17 Cr 4.46 V 1.05 Mo 9.57 W 2.83 Co 8.92 Ti 0.22 Fe 70.9
133	high speed steel		24/4	C 1.37 Si 0.31 Mn 0.58 S 0.023 Cu 0.34 Ni 0.26 Cr 3.99 V 4.62 Mo 1.54 W 11.71 Co 0.03 Ti 0.02 Fe 75.5
134	tool steel	ch	M2	C 0.86 Si 0.39 V 1.9 Cr 4.3 Mn 0.31 Ni 0.20 Cu 0.14 Co 0.16 Mo 5.1 W 6.3 Fe 80.5
135	tool steel	ch	T1	C 0.79 Si 0.29 V 1.1 Cr 4.3 Mn 0.33 Co 0.39 Ni 0.23

				Cu 0.12 Mo 0.40 W 18.0 Fe 74.0
136	tool steel	ch	D2	C 1.49 Si 0.35 V 0.97 Cr 12.1 Mn 0.32 Ni 0.23 Cu 0.05 Mo 0.86 W 0.15 Fe 83.5
137	cast iron	*	KS	C 1.7 Si 3.2 S 0.14 Cr 0.7 Mn 0.13 Ni 0.01 Mo 0.6 Fe 93.5
138	cast iron	*	US	C 2.85 Si 0.6 P 0.6 S 0.02 Cr 1.2 Mn 0.3 Ni 0.04 Cu 1.4 Fe 93.0
139	cast iron	*	RS	C 2.8 Si 1.6 P 0.4 S 0.05 Cr 0.17 Cu 0.06 Mo 0.1

				Sn 0.07 Sb 0.05 Pb 0.015 Fe 93.0
140	cast iron	*	IN	C 3.45 Si 1.75 P 0.05 S 0.01 Cr 0.04 Mn 0.2 Ni 0.7 Cu 0.12 Fe 93.6
141	cast iron	*	PN	C 4.0 Si 0.95 P 0.27 S 0.2 Ni 1.2 Cu 0.5 Fe 93.9
142	Al-alloy		CKD 401	Al 85 Si 6.9 Ti 0.29 Cr 0.26 Mn 0.83 Fe 1.01 Cu 3.9 Zn 0.99
143	Al-alloy		CKD 405	Mg 1.20 Al 83 Si 12.2 Cr 0.28 Mn 0.65 Fe 0.47 Ni 1.37 Cu 0.31 Zn 0.18

144	Ni-Alloy	ch	Inco 718	Al 0.56 Ti 1.0 Cr 18.5 Mn 0.11 Fe 18.8 Co 0.25 Ni 52.2 Nb 5.1 Mo 3.1
145	Ni-alloy	ch	Inco 625	Ti 0.28 Cr 21.3 Mn 0.22 Fe 4.4 Co 0.19 Ni 60.9 Nb 3.3 Mo 8.8
146	Ni-alloy	ch	Haynes 214	Al 4.4 Cr 16.1 Mn 0.17 Fe 3.6 Ni 75.6
147	Ni-alloy	ch	Haynes 230	Al 0.37 Cr 21.5 Mn 0.50 Fe 1.4 Co 0.40 Ni 60.1 Mo 1.04 W 14.2
148	Ni-alloy	ch	Haynes 242	Al 0.24 Cr 7.9 Mn 0.33 Fe 1.09 Ni 64.7 Mo 25.4

149	Ni-alloy	ch	Hastalloy G-30	Al 0.20 Cr 28.8 Mn 1.11 Fe 14.9 Co 3.6 Ni 40.3 Nb 0.70 Mo 5.0 W 3.1
150	Ni-alloy		PY-79	C 0.006 Al 0.03 Si 0.09 Mn 0.50 S 0.002 Mo 3.5 Cu 4.3 Fe 14.8 Ni 77
151	Ni-alloy		PY-80	C 0.006 Al 0.03 Mn 0.50 S 0.040 Mo 3.6 Nb 3.0 Cu 0.06 Ti 3.0 Fe 10.2 Ni 79.5
152	Cu-alloy	ch	CDA 485	Fe 0.08 Zn 36.1 Sn 0.99 Pb 1.8 Cu 61.0
153	Cu-alloy	ch	CDA 655	Si 3.1 Mn 1.02 Fe 0.04 Cu 96

154	Cu-alloy	ch	CDA 836	Fe 0.03 Ni 0.78 Zn 4.3 Sn 4.6 Sb 0.09 Pb 5.4 Cu 85
155	Cu-alloy	ch	CDA 937	Sb 0.35 Ni 0.36 Zn 0.27 Sn 9.8 Pb 9.6 Cu 80
156	Cu-alloy	ch	CDA 955	Mn 0.16 Fe 4.0 Ni 4.4 Zn 0.09 Al 10.6 Cu 81
157	Cu-alloy	ch	CDA 932	Fe 0.08 Ni 0.09 Zn 3.2 Sn 6.7 Sb 0.07 Pb 6.4 Cu 83.4
158	Cu-alloy	ch	CDA 863	Al 6.0 Fe 2.3 Mn 3.7 Zn 23.3 Sn 0.04 Pb 0.03 Cu 65
159	Cu-alloy	ch	CDA 642	Al 7.0 Fe 0.10

				Si 1.97 Zn 0.20 Sn 0.05 Cu 90.6
160	Ag-alloy		P5Ag19Cu75	P 5.8 Ag 18.9 Cu 75
161	Ag-alloy		Cu16Zn16Cd25Ag42	Cu 16.0 Zn 16.5 Cd 25.0 Ag 42.3
162	Ag-alloy		Cu27Zn21Ag51	Cu 27.1 Zn 21.3 Ag 51.6
163	Ag-alloy		Cu17Ag83	Cu 17.1 Ag 82.8
164	cassiterite		SnO_2	Sn 78.8 O 21
165	pollucite		$CsAl_2Si_3O_{10}$	Cs 33.3 Al 10.4 Si 21.1 O 35
166	apatite		$Ca_3(PO_4)_2$	P 19 Ca 41 O 40
167	celestinite		$SrSO_4$	S 16 Sr 51 O 33

168	scheelite		$CaWO_4$	Ca 15.6 W 62.0 O 22
169	crocoite		$PbCrO_4$	Cr 18.7 Pb 59.5 O 22
170	baryte		$BaSO_4$	S 15.0 Ba 55.8 O 29
171	skutterudite		$(Co, Ni, Fe)As_3$	S 3.3 Co 15.4 Ni 5.0 Fe 2.9 As 73.3
172	titanite brasil		$CaTiSiO_5$	Al 1.4 Si 17.0 Ca 19.2 Ti 20.6 O 41
173	yttrium oxide	p	Y_2O_3	Y 79 O 21
174	barium carbonate	p	$BaCO_3$	Ba 70 O 24 C 6
175	neodymium oxide	p	Nd_2O_3	Nd 79 O 21
176	europium oxide	p	Eu_2O_3	Eu 86 O 14

177	gadolinium oxide	p	Gd_2O_3	Gd 87 O 13
178	dysprosium oxide	p	Dy_2O_3	Dy 87 O 13
179	holmium oxide	p	Ho_2O_3	Ho 87 O 13

Abreviations of material property description:

* = heterogenious material
p = powdered material
ch = chipping material
s = synthetic material