GELLER
MICROANALYTICAL
LABORATORY, Inc.
426e BOSTON ST., TOPSFIELD, MA 01983-1216
TEL 978 887-7000 FAX 978-887-6671 http://www.gellermicro.com

Certified to ISO-9001 and 17025

Pure Elements & Compounds

November 2016

STANDARD	Formula	FORM	PURE	STANDARD	Formula	FORM	PURE	STANDARD	Formula	FORM	PURE
Aluminum	Al	F	4N	Indium Antimonide	InSb	P	3N ?	Selenium	Se	C	3N
Aluminum Fluoride	AlF3	P	2N5	Indium Tin Oxide	ITO	P	4N	Silicon	Si	C	5N
Aluminum Oxide	Al2O3	C	4N ?	10% In, inhomogenous				Silicon Carbide	SiC	CVD	Opt ?
Aluminum Nitride	AlN	P	2N+	Iridium	Ir	P	3N5	Silicon Dioxide	SiO2	EM	2N5 ?
Antimony	Sb	B	4N8	Iron Carbide	Fe3C	F	3N	1000Å/Silicon	SiO2	TF	3N5
Barium Fluoride	BaF2	C	2N	Iron	Fe	P	4N	Silicon Nitride	Si3N4	HP	2N
Barium Sulfate	BaSO4	P	3N ?	Iron Fluoride	FeF2	F	3N	468Å/Silicon	Si3N4	TF	2N5
Barium Titanate	BaTi4O9	HP	2N5 ?	Iron Fluoride	FeF3	P	3N	Silver	Ag	F	3N
Barium Titanate	BaTiO3	P	3N	Iron Nitride	Fe2.4N	P	3N ?	Silver Chloride	AgCl	C *	5N
Beryllium	Be	F	2N	Iron Oxide	FeO	P	3N ?	Silver Oxide	Ag2O	P	3N ?
Bismuth	Bi	B	6N?	Iron Oxide	Fe2O3	P	5N	Silver Sulfide	Ag2S	C	?
Bismuth Telluride	Bi2Te3	B	2N5N	Iron Oxide	Fe3O4	EM	5N	Sodium Chloride	NaCl	C	2N5
Bismuth Oxide	Bi2O3	P	2N5 ?	Iron Phosphide	FeP	EM	3N	Sodium Fluoride	NaF	C	5N
Boron	B	B	2N5	Iron Sulfide	FeS2	P	3N?	Strontium Fluoride	SrF2	C	3N
Boron Carbide	B4C	P	5N?	Lead	Pb	F	4N8	Tantalum	Ta	F	3N5
Boron Nitride	BN	B	4N	Lead Oxide	PbO	F	2N8	Tantalum Carbide	TaC	HP	3N?
Boron Phosphide	BP	P	3N	Lead Sulfide	PbS	P	Opt ?	Tantalum Nitride	TaN	P	4N8
Cadmium	Cd	F	4N7	Lanthanum Hexaboride	LaB6	P	3N5 ?	Tantalum Oxide	Ta2O5	P	1N8 ?
Cadmium Sulfide	CdS	P	3N	Lanthanum Fluoride	LaF3	P	Opt	Tantalum Oxide	Ta2O5	TF	2N8
Calcium Carbonate	CaCO3	C	3N ?	Lutetsium Fluoride	LuF3	P	3N	1000Å/Ta			2N5
Calcium Fluoride	CaF2	C	3N	Lithium Fluoride	LiF	P	4N	Tantalum Silicide	TaSi2	P	2N5
Carbon (Pyrolytic)	C	CVD	3N ?	Magnesium	Mg	C *	3N	Tellurium	Te	B	5N
Carbon (Diamond)	C	C	?	Magnesium Fluoride	MgF2	F	3N?	Terbium	Tb	F	3N
Cerium Oxide	CeO2	P	2N1	Magnesium Oxide	MgO	C	4N	Thallium Chloride	TlCl	P	3N8 ?
Cesium Iodide	CsI	O *	2N ?	Manganese	Mn	B	3N	Thorium Oxide	ThO2	P	2N5 ?
Cesium Bromide	CsBr	P *	4N	Manganese Sulfide	MnS	B	2N5	Thulium	Tm	F	2N5
Chromium	Cr	B	4N6	Manganese Oxide	MnO2	P	?	Tin	Sn	F	5N
Chromium Carbide	Cr3C2	P	2N8	Mercury Telluride	HgTe	C	5N	Tin Oxide	SnO2	EM	2N5
Chromium Nitride	Cr2N	P	2N5	Mercury Sulfide	HgS	P	4N5 ?	Titanium	Ti	F	2N5
Chromium Oxide	Cr2O3	HP	5N	Molybdenum	Mo	C	4N	Titanium Al Carbide	Ti2AlC	P	2N ?
Cobalt	Co	F	5N	Molybdenum boride	MoB	P	2N	Titanium Carbide	TiC	HP	2N5
Cobalt Oxide	Co3O4	P	3N	Molybdenum Carbide	Mo2C	F	3N5 ?	Titanium Diboride	TiB2	HP	2N5 ?
Cobalt Silicide	CoSi2	P	2N	Molybdenum Silicide	MoSi2	HP	3N	Titanium Dioxide	TiO2	EM	2N5
Copper	Cu	F	4N5	Molybdenum Oxide	MoO3	P	2N5 ?	Titanium Nitride	TiN	P	4N5
Cupric Oxide	CuO	P	3N	Osmium	Os	P	4N5	Titanium Oxide	TiO	HP	3N
Cuprous Oxide	Cu2O	EM	3N	Neodymium oxide	Nd2O3	P	2N8	Titanium Silicide	TiSi2	P	3N
Copper Sulfide	CuS	M	3N	Neodymium fluoride	NdF3	F	3N	Tungsten	W	F	4N
Copper Sulfide	Cu2S	M	2N+ ?	Nickel	Ni	C	4N4	Tungsten Carbide	WC	HP	4N8
Dysprosium	Dy	F *	3N	Nickel oxide	NiO	F	3N5 ?	Tungsten Nitride	WN	P	3N
Erbium	Er	F *	3N ?	Nickel Phosphide	Ni2P	P	3N	Tungsten Oxide	WO3	P	2N+
Europium Oxide	Eu2O3	HP	3N	Nickel Silicide	NiSi2	P	3N?	Tungsten Silicide	WSi2	P	2N5
Gadolinium	Gd	F *	3N ?	Niobium	Nb	F	3N7	Vanadium	V	F	2N5
Gallium Arsenide	GaAs	C	5N ?	Nickel Aluminide	NiAl	P	2N5	Vanadium Carbide	VC	HP	4N ?
Gallium Nitride	GaN	P	3N	Niobium Carbide	NbC	P	2N5 ?	Vanadium Nitride	VN	P	2N5 ?
Gallium Phosphide	GaP	P	2N5 ?	Niobium Oxide	Nb2O5	HP	4N ?	Vanadium Oxide	V2O5	P	4N ?
Gallium Antimonide	GaSb	P	2N5 ?	Palladium	Pd	P	3N	Ytterbium	Yb	F	3N
Germanium	Ge	B	2N	Platinum	Pt	F	3N	Ytterbium oxide	YB2O3	P	3N
Germanium Oxide	GeO	P	2N5	Potassium Bromide	KBr	F	4N?	Yttrium	Y	F *	3N
Gold	Au	F	4N	Potassium Chloride	KCl	C	3N5 ?	YAG	YAlO	C	?
Hafnium	Hf	F	2N5 ?	Potassium Iodide	KI	C	3N?	Yttrium Oxide	Y2O3	P	4N
Hafnium Boride	HfB2	P	4N7	Praeseodymium Fluoride	PrF3	C	3N8	Zinc	Zn	F	3N8
Hafnium Carbide	HfC	B	6N	Rhenium	Re	F	3N7	Zinc Oxide	ZnO	HP	3N
Hafnium Nitride	HfN	P	2N5	Rhenium Oxide	ReO2	P	3N?	Zinc Selenide	ZnSe	C	?
Hafnium Oxide	HfO2	P	3N?	Rhodium	Rh	W	2N8	Zinc Sulfide	ZnS	C	?
Holmium	Ho	B	3N	Rubidium Chloride	RbCl	F	3N?	Zirconium	Zr	F	3N5
Indium	In	F	4N	Rubidium Iodide	RbI	P	2N7	Zirconium Carbide	ZrC	HP	?
Indium Arsenide	InAs	C	?	Ruthenium	Ru	P	2N8	Zirconium Nitride	ZrN	P	2N5
Indium Phosphide	InP	C	5N ?	Samarium	Sm	F	3N	Zirconium Oxide (Mineral)	ZrO2	C	2N7 ?
				Scandium	Sc	F	4N88				

* These standards are very sensitive to humidity and should be kept in vacuum. We suggest our Vacu-Storr

M	Natural mineral	B	Bulk material	?	No certificate available. Most original containers with marked purity. With EDS analysis we see no additional elements (>0.1%)
Opt	optical crystal	C	Crystalline	"N"	is the # of "9"'s. 5N would be 99.999% pure, 2N5 would be 99.5%
TF	Thin film	EM	End member mineral	"+"	means higher purity
HP	Hot pressed	F	Foil	W	wire section

Minerals

i

MINERAL	FORMULA (Approximate formula)
Acanthite	Ag_2S
Albite	$NaAlSi_3O_8$
Almandine	$Fe_3+2Al_2(SiO_4)_3$
Andradite	$Ca_3Fe_2+3(SiO_4)_3$
Anorthite	$CaAl_2Si_2O_8$
Augite	$(Ca,Na)(Mg,Fe,Al,Ti)(Si,Al)_2O_6$
Baddeleyite	ZrO2
Barite	$BaSO_4$
Benitoite	$BaTiSi_3O_9$
Biotite (black mica)	$K(Mg,Fe^{+2})_3(Al,Fe^{+3})Si_3O_{10}(OH,F)_2$
Bytownite	$(Na,Ca)Al(AL,Si)Si_2O_8$
Calcium Carbonate	$CaCO_3$
Cassiterite	SnO_2
Chalcocite	Cu_2S
Cinnabar	HgS
Chrysoberyl	$BeAl_2O_4$
Covellite	CuS
Cuprite	Cu_2O
Diamond	C (natural cleaved ~1mm)
Diamond (like)	Matches Raman for Diamond
Diopside	$CaMgSi_2O_6$
Dolomite	$CaMg(CO_3)_2$
Fayalite	$Fe_2^{2+}SiO_4$
Fluorapatite	$Ca_5(PO_4)_3F$
Forsterite	Mg_2SiO_4
Hematite	Fe_2O_3
Hornblende (Amphibole)	$Ca_2(Mg,Fe^{2+})_4Al(Si_7Al)O_{22}(OH,F)_2$
Kyanite	$Al_2O_3•SiO_2$
Magnetite	Fe_3O_4
Orthoclase	$K_2O•Al_2O_3•6SiO_2$
Pyrope	$Mg_3Al_2(SiO_4)_3$
Quartz	SiO_2
Rutile	TiO_2
Sodalite	$Na_4(AlCl)Al_2(SiO_4)_3$
Spessartine	$Mn^{2+}{}_3Al_2(SiO_4)_3$
Spinel	$MgAl_2O_4$
Titanite	$CaTiSiO_5$
Uraninite	UO_2
Willemite (Troosite)	Zn_2SiO_4
Wollastonite	$CaSiO_3$

Note: electron probe compositions provided upon request or with standard. Some standards have minor phases of other materials

NIST Standards: Glasses & Alloys

Glasses	B2O3	Na2O	MgO	Al2O3	SiO2	Cl	K2O	CaO	TiO2	V2O5	Cr2O3	MnO2	Fe2O3	ZrO2	PbO	Bi2O3	BaO	ZnO	CoO	CuO
612		14.0		2.0	72.0			12.0		+50 ppm of 51 other elements										
93a	12.5	3.9		2.2	80.8	.06	.01	.01	.01				.028	.04						
K252					40.0							5.0					35.0	10.0	5.0	5.0
K229					30.0										70.0					
K326	30.0	2.0	30.1		29.9			8.0												
K309				15.0	40.0			15.0					15.0				15.0			

	Fe	C	Mn	P	S	Si	Cu	Zn	Pb	Sn	Ni	Cr	V	Mo	Ti	As	W	Zr	Nb	Ta	Al	Co
Ti Alloys																						
654b	.23					.045	.004			.023	.028	.025	4.31	.013	88.05			.008			6.34	
1128	.134	.011								3.04		2.96	15.13		75.64						3.06	
Miscellaneous NIST Standards																						
1104	.088			.005			61.33	35.31	2.77	.43	.07											
1108	.004		.0025				64.9	34.4	0.06	.39	.033											
1110	.033						84.5	15.2	0.03	.051	.053											
1230	Bal	.044	.64	.023	.0007	.43	.14				24.2	14.8	.23	1.18	2.12						.24	.15
1243	.79	.024	.019	.003	.0018	.018	.007				58.78	19.20	.12	4.25	3.06			.053			1.23	12.46
1297		.066	7.11	.038	.0033	.397	.442				5.34	16.69	.08	.33								.13
C2402	7.3	.01	.64	.007	.018	.85	.19				51.5	16.15	.22	17.1			4.29					1.5
2321	Solder: Sn 60%, Pb 40%																					
SRM-481	6 wire in one 3mm φ disc. Ag:Au (pure Ag, pure Au, 20:80, 40:60, 60:40, 80:20).																					
SRM-482	5 wires in one 3mm φ mount. Cu:Au (20:80, 40:60, 60:40, 80:20) + pure Cu.																					
871	Phosphor bronze (CDA-521)																					

Steels																						
461	Bal	.15	.36	.053	.019	.047	.34	.003	.022	1.73	.13	.024	.3	.01	.028	.01	<.005	.011	.002	.005	.26
462	Bal	.40	.94	.045	.019	.28	.20	.006	.066	.70	.74	.058	.08	.037	.046	.053	.063	.096	.036	.02	.10
464	Bal	.54	1.32	.017	.021	.48	.094	.02	.043	.13	.078	.29	.029	.004	.018	.022	.01	.037	.069	.005	.02
465	Bal	.037	.032	008	.01	.029	.019	<.0005	.001	.026	.004	.002	.005	.20	.01	.001	.002	.001	.001	.19	.03
466	Bal	.065	.11	.012	.009	.025	.033	.001	.005	.051	.011	.007	.011	.057	.014	.006	<.005	.005	.002	.01	.04
467	Bal	.11	.23	.033	.009	.26	.067	.00	.1	.088	.036	.041	.021	.26	.14	.20	.094	.29	.23	.16	.07
468	Bal	.26	.47	.023	.02	.075	.26	<.0005	.009	1.03	.54	.17	.20	.011	.008	.077	<.005	.006	.005	.04	.16
661	Bal	.39	.66	.015	.015	.223	.042		.01	1.99	.69	.011	.19	.02	.017	.01	.009	.22	.02	.02	.03
663	Bal	.57	1.50	.02	.005	.74	.09	.0022		.32	1.31	.31	.30	.05	.01	.04	.05	.049		.24	.05
664	Bal	.87	.25	.01	.025	.066	.25	.024		.14	.06	.10	.49	.23	.05	.10	.069	.15	.11		.15
665	Bal	.008	.0057	.002	.0059	.008	.0058			.041	.007	.0006	.005	.0006	.002						.01
1761	Bal	1.03	.68	.043	.033	.19															
1762	Bal	.034	2.03	.036	.03	.36															
1763	Bal	.20	1.59	.012	.022	.65															
1764	Bal	.59	1.22	.023	.012	.06	.5				1.48	.106	.20	.28				.42			
1765	Bal	.006	.14	.007	.004	.005															
1766	Bal	.015	.06	.004	.002	.01															
1767	Bal	.051	.02	.005	.009	.02															
1768	Bal	.001	.014	.0013	.0003		.0006			.0014										.002	.002

Alloys- Certified by a group of laboratories, NIST traceable (but not under ISO-17025 or ISO-9000)
Analysis provided with each alloy purchased.

Stainless Steels + High Temp.	**Low Alloy + Specialty**	**Nickel/Cobalt**	**Copper/Brass/Bronze**
AISI 302	C-4140	Inco 600	CDA 360
AISI 303	C-4340	Inco 625	CDA 510
AISI 304	C-8620	Inco 718	CDA 655
AISI 316	Tool Steel A-6	Inco 800	CDA 857
AISI 321	Tool Steel D-2	Hastaloy C-22	
AISI 410	Tool Steel H-13	Hastoloy C-276	
AISI 440C	Tool Steel M-2	Hastoloy X	
PH13-8MO	2-Cr-1Mo (36a)		
15-5 PH	9Cr-1Mo (38a)		
17-4PH	50 NIL		
CARP 20CB3	52100		
Maraging 300	AISI 4820		
HK-40	AISI 9310		

PLEASE READ CAREFULLY!

The metal alloys on this list cannot be assumed to be homogenous at the micrometer scale. If you intend to use ZAF corrections electron beam excited x-ray analysis (wavelength or energy dispersive) the sample volume must be homogenous within the electron excited volume. It is a misuse to use these metal alloys for bulk quantitative analyses. Nevertheless, they are useful for comparison purposes (in a least square sense) to compare against unknown materials. Every effort is made to insure that cutting, grinding, and polishing of the materials do not alter their composition. Our standards are alumina abrasive and epoxy free as they are not used in the preparation.

Miscellaneous Standards (some traceable):
BPSG (not a NIST standard), 4% P, 3.3% B.
Al-Cu: NIST traceable standard for energy dispersive x-ray detector calibration.
C-Cu-Ag: Standard for electron backscattering adjustment. Used for gunshot residue calibration
GSR- Gun shot residue: mixture of BaF2, Sb, and Pb particles in epoxy and carbon coated.

Bold marked standards are at extra cost. See price list or call.

- **If you do not see a standard on the list that you would like, please contact us for availability.**
- **We can custom prepare your materials for use in our mounting system.**
- **We will polish your Taylor, Microbeam Consultants, SPI or other standard mounts. Price on request.**