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E, Chemistry and Physics, 39

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

MINERAL ANALYSES

FROM THE

LABORATORIES OF THE UNITED STATES GEOLOGICAL SURVEY

1880 to 1903

TABULATED BY

F. W. CLARKE, Chief Chemist

WASHINGTON

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CONTENTS.

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
Washington, D. C., October 3, 1903.

SIR: I have the honor to transmit herewith a paper entitled "Mineral Analyses from the Laboratories of the United States Geological Survey, 1880–1903, tabulated by F. W. Clarke, Chief Chemist." Much of the material of this paper is unpublished, and it is very desirable that the whole should be printed in a conveniently accessible form.

Very respectfully,

GEORGE F. BECKER,
Geologist in Charge,
Division of Physical and Chemical Research.

Hon. CHARLES D. WALCOTT,
Director United States Geological Survey.

MINERAL ANALYSES FROM LABORATORIES OF UNITED STATES GEOLOGICAL SURVEY, 1880-1903.

Tabulated by F. W. CLARKE, *Chief Chemist.*

INTRODUCTION.

In the present bulletin I have brought together and classified 507 analyses of minerals from the laboratory records of the United States Geological Survey. A large proportion of these analyses have been already published elsewhere, but they are so scattered that their collection in one place seemed to be desirable. Over 150 distinct species are represented, and among them a considerable number were originally described by chemists connected with the Survey. These species are josephinite, cuprobismutite, warrenite, guitermanite, elpasolite, zunyite, ptilolite, hydronephelite, lucasite, antlerite, knoxvillite, redingtonite, plumbojarosite, emmonsite, and powellite. In other cases minerals which were imperfectly described have been more sharply characterized and their true composition made known. Natrojarosite, for example, is here definitely recognized as a species.

In general the order of Dana's classification has been followed, but with some small variations. Thus the tellurides are put in a group by themselves, the borosilicates are brought together, while the phosphates, vanadates, and arsenates are given as three separate classes. On purely chemical grounds these changes are warranted; on morphological grounds the usual mineralogical classification may be better.

Detailed descriptions of the various minerals have been purposely omitted. Neither are the analyses discussed. These deficiencies, however, are mitigated by the literature references to descriptions published elsewhere. Such references as "annual report," "bulletin," or "monograph" relate to the regular publications of this Survey; all other references are easily recognizable.

I. NATIVE ELEMENTS.

GOLD.

From Persia; exact locality unknown. Analyzed by Charles Catlett.

Au	93.24
Ag	6.65
Fe	.11
Cu	none
	100.00

JOSEPHINITE.

A nickel-iron alloy found in placer gravels in Jackson and Josephine counties, Oreg. Described as a new species by W. H. Melville, Am. Jour. Sci., 3d ser., vol. 43, 1892, p. 509. Waterworn pebbles. Specific gravity, 6.204.

Ni	60.45
Co	.55
Fe	23.22
Pyrrhotite	.55
Chromite, Magnetite	.12
Cu	.50
As	.23
Cl	.04
Silicates (anhydrous)	12.26
H_2O below 100°	.81
H_2O above 100°	1.12
Volatile matter	.70
CO_2	trace
	100.55

The silicate admixture, including the water, amounts to 13.38 per cent, of which 12.88 per cent, soluble in hydrochloric acid, is serpentine. The insoluble portion may be bronzite. Analyses of the silicates are as follows:

	Total.	Insoluble portion.	Soluble portion.
SiO_2	5.14	0.23	4.91
Al_2O_3	.33	.03	.30
Fe_2O_3	2.08	.04	2.04
NiO, CoO	.32	trace	.32
CaO	1.62	.06	1.56
MgO	2.69	.14	2.55
Na_2O	.08	----	.08
H_2O above 100°	1.12	----	1.12
	13.38	.50	12.88

For analyses of nickel-iron of meteoric origin, see Bulletin 168.

II. SULPHIDES AND ARSENIDES.

BISMUTHINITE.

From the Rosario Mining District, Sinaloa, Mexico. Analysis by W. H. Melville. Described by him in Bulletin 90.

Bi	72.90
Pb	6.03
Cu	1.67
Fe	.35
S	18.11
Quartz	.63
	99.69

METACINNABARITE.

Crystallized material from New Almaden, Cal. Analysis by W. H. Melville. Not free from admixtures.

Hg	78.01
S	13.68
Fe	.61
Co	trace
Zn	.90
Mn	.15
$CaCO_3$	.71
Quartz	4.57
Organic matter	.63
	99.26

Another specimen of metacinnabarite from Knoxville, Cal., gave Melville the following figures:

HgS	98.48
FeS	.69
SiO_2	.71
	99.88

The latter mineral was described by Melville and Lindgren in Bulletin 61.

COVELLITE.

From the East Greyrock mine, Butte, Mont. Collected by G. W. Tower. Analysis by W. F. Hillebrand. Color, indigo-blue. Massive. Specific gravity, 4.76 at 26°.

Cu	66.06
S	33.87
Fe	.14
Insoluble	.11
	100.18

POLYDYMITE.

A massive ore from the mine of the Canadian Copper Company, Sudbury, district of Algoma, Ontario. Specific gravity, 4.541. Analysis by Charles Catlett. Described by Clarke and Catlett in Am. Jour. Sci., 3d ser., vol. 37, 1889, p. 372. Composition nearly Ni_3FeS_5.

A. Actual analysis.

B. Analysis corrected by deduction of quartz and chalcopyrite.

	A.	B.
Ni	41.96	43.18
Fe	15.57	15.47
S	40.80	41.35
Cu	.62	.....
SiO_2	1.02	.....
	99.97	100.00

Another nickel-iron sulphide, from the Worthington mine, Sault branch of the Canadian Pacific Railway, 25 miles west of Sudbury, has been analyzed by W. F. Hillebrand. Grayish, with a cast of yellow. Not pyrrhotite. Possibly a mixture of polydymite and pyrite.

Fe	38.36
Ni	4.57
Mn	.10
S	45.11
SO_3	.95
CO_2	[a]1.49
CaO	1.91
MgO	.41
H_2O at 105°	.55
Insoluble	4.80
	98.25

STROMEYERITE.

From the Silver King mine, Calico, San Bernardino County, Cal. Specific gravity, 6.28. Analysis by W. H. Melville. Described by Melville and Lindgren in Bulletin 61.

Ag	53.96
Cu	28.58
Fe	.26
S	15.51
Residue	1.55
	99.86

SULPHIDE OF SILVER, COPPER, AND ZINC.

Massive, resembling bornite. Apparently homogeneous, but may be a mixture. Specific gravity, 5.407 at 20°. Analyzed by W. F.

[a] Calculated to saturate CaO.

Hillebrand and described in Bulletin 55. From the Gagnon mine, Butte, Mont.

Cu	40.24
Ag	21.80
Pb	1.46
Zn	12.83
Fe	1.98
S	20.88
	99.19

LÖLLINGITE.

From Teocalli Mountain, Brush Creek, Gunnison County, Colo. Specific gravity, 7.400 at 14.5°, corrected for impurity. Analyzed by W. F. Hillebrand and described in Bulletin 20.

As	71.18
S	.56
Bi	.08
Cu	.39
Fe	22.96
Co	4.37
Ni	.21
	99.75

A doubtful arsenide of nickel and cobalt has also been examined by Hillebrand and described in Proc. Colorado Sci. Soc., vol. 3, pt. 1, p. 46. From the Rose mine, Grant County, N. Mex. Specific gravity, 6.644 at 20°. Probably a mixture. Ni: Co=3:1, approximately.

As	74.04
S	.13
Ag	4.78
Cu	.04
Pb	.03
Fe	.44
Ni, Co	19.52
CaO	.09
MgO	.05
	99.12

ENARGITE.

From the Rarus mine, Butte, Mont. Collected by G. W. Tower. Analysis by W. F. Hillebrand.

Cu	48.67
Fe	.33
Zn	.10
As	17.91
Sb	1.76
S	31.44
Insoluble	.11
	100.32

CUPROBISMUTITE.

New species, discovered by W. F. Hillebrand and described by him in Bulletin 20. Named by Dana. Specific gravity, 6.680 at 15°, corrected for impurities. From the Missouri mine, Halls Valley, Park County, Colo. Analyses, by Hillebrand, of three different samples.

	I.	II.	III.
Bi	60.74	63.36	62.45
Ag	.89	4.09	9.89
Cu	15.96	12.65	6.68
Pb	----------	----------	2.74
Fe	2.13	.59	.10
Zn	.10	.07	.07
S	[a] 19.94	[a] 18.83	17.90
	99.76	99.59	99.83

[a] Calculated.

ZINKENITE.

From the Brobdignag mine, Red Mountain, San Juan County, Colo. Specific gravity, 5.21 at 18°. Analyzed by W. F. Hillebrand and described by him in Bulletin 20.

	I.	II.
Sb	35.00	----------
As	5.64	5.59
Pb	32.77	32.79
Cu	1.20	----------
Ag	.23	----------
Fe	.02	----------
CaO	.31	----------
Alkalies	.45	----------
S	22.50	22.50
Gangue	.59	----------
	98.71	----------

WARRENITE.

New species, described by L. G. Eakins in Am. Jour. Sci., 3d ser., vol. 36, 1888, p. 450. From the Domingo mine, Gunnison County, Colo. Occurs in matted, fibrous masses, known locally as "mineral wool." Analysis by Eakins.

Pb	39.33
Sb	36.34
S	21.19
Ag	trace
Fe	1.77
Mn	trace
Insoluble	.52
	99.15

COSALITE.

From the Comstock mine, near Parrott City, La Plata County, Colo. Described by W. F. Hillebrand in Bulletin 20.

Bi	42.93
Ag	8.43
Cu	7.50
Pb	22.49
Fe	.70
Zn	trace
S	17.11
	99.16

FREIESLEBENITE.

From Augusta Mountain, Gunnison County, Colo. Known locally as "mineral wool." Remarkable for its freedom from silver. Analyzed by L. G. Eakins and described by him in Am. Jour. Sci., 3d ser., vol. 36, 1888, p. 452.

Pb	55.52
Sb	25.99
S (calculated)	18.98
Ag	trace
Fe	trace
Zn	trace
	100.49

GUITERMANITE.

New species, discovered by W. F. Hillebrand and described by him in Bulletin 20. From the Zuñi mine, Anvil Mountain, near Silverton, San Juan County, Colo. Forms the matrix of zunyite. Corrected specific gravity, 5.94 at 17.5°. Analyses by Hillebrand.

	I.	II.
Admixed zunyite	1.77	3.82
As	13.40	13.00
Pb	63.60	61.63
Cu	.17	.17
Ag	.02	.02
Fe	.43	.88
S	19.67	19.56
O	----------	.55
	99.06	99.63

III. TELLURIDES.

HESSITE.

From San Sebastian, Jalisco, Mexico. Specific gravity, 8.24 at 26°. Analysis by W. F. Hillebrand.

Ag	61.16
Te	36.11
Pb	1.90
S, Fe, Zn	undet.
	99.17

PETZITE.

From the Norwegian mine, Calaveras County, Cal. Collected by F. L. Ransome. Specific gravity, 8.925 at 23°. Analysis by W. F. Hillebrand. Formula, $Au_2Te.3Ag_2Te$.

Ag	41.87
Au	25.16
Te	33.21
Se	trace
Mo	.08
	100.32

CALAVERITE.

From Cripple Creek, Colo. Collected by R. A. F. Penrose, jr. Analyzed by W. F. Hillebrand and described by him in Bulletin 167.

A. From the Prince Albert mine. Corrected specific gravity, 9.0 at 24°.

B. Raven mine.

C. C. O. D. mine.

	A.	B.	C
Te	57.27	47.69	53.89
Au	38.95	33.93	39.31
Ag	3.21	1.47	.85
Insoluble matter	.33	5.80	.91
Fe_2O_3	.12	----	----
Fe	----	5.41	1.67
S	----	[a]6.17	1.58
Mn	----	----	[b].23
Ca	----	----	.51
Mg	----	----	.10
O, F, and soluble SiO_2 by difference	----	----	.95
	99.88	100.47	100.00

[a] Calculated from Fe to make FeS_2.

[b] $AsMnO_2$?

MELONITE.

From the Melones mine, Carson Hill, Calaveras County, Cal. Collected by F. L. Ransome. Analyzed by W. F. Hillebrand and described by him in Bulletin 167. Three samples. Specific gravity of B, 7.72 at 22.5°, which is probably too high for the pure $NiTe_2$. Sample C is the purest.

	A.	B.	C.
Te	75.29	77.72	80.75
Ni	15.71	17.16	18.31
Co		.10	
Ag	8.44	5.09	.86
	99.44	100.07	99.92

IV. CHLORIDES AND FLUORIDES.

HALITE.

Rock salt from Salton, Cal. Analysis by E. T. Allen.

NaCl	94.54
KCl	.31
Na_2SO_4	3.53
$CaSO_4 2H_2O$	.79
Moisture	.14
Insoluble residue	.50
	99.81

EMBOLITE.

From Broken Hill, Australia. Analysis by L. G. Eakins.

AgCl	59.97
AgBr	39.22
H_2O	.63
	99.82

CRYOLITE.

From St. Peters Dome, Pikes Peak district, Colorado. Described by Cross and Hillebrand in Bulletin 20. Massive. Pinkish in color. Specific gravity, 2.972 at 24°. Analysis by W. F. Hillebrand.

Al	12.81
Na	32.40
Ca	.28
F	53.55
Fe_2O_3	.40
H_2O	.30
	99.74

PACHNOLITE.

From St. Peters Dome, Pikes Peak district, Colorado. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

A. Compact bluish variety. Specific gravity, 2.980 at 22°.

B. Crystalline coating.

C. Fresh, transparent, crystalline material.

D. Carefully selected crystals. Specific gravity, 2.965 at 17°; 2.962 at 22°.

	A.	B.	C.	D.
Al	11.94	12.93, 12.92	12.14	12.27
Ca	19.32	15.27, 15.17	18.06	18.04
Mg	.13	1.53		
Na	10.43	10.28	10.23	10.25
K		.13		
H_2O	7.87, 7.95	8.64, 8.79	8.10, 8.11	8.05
F			51.33, 51.28	[a]51.39
			99.86	100.00

[a] By difference.

ELPASOLITE.

From St. Peters Dome, Pikes Peak district, Colorado. Described as a new species by Cross and Hillebrand in Bulletin 20. Incomplete analysis on insufficient material, by W. F. Hillebrand. The fluorine was deduced by calculation on the assumption that the metals are fully combined with it.

Al	11.32
Ca	.72
Mg	.22
K	28.94
Na	9.90
F	46.98
	98.08

GEARKSUTITE.

From St. Peters Dome, Pikes Peak district, Colorado. Described by Cross and Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

Al	15.20
Ca	22.30
Na	.10
K	.04
H_2O	15.46
F	42.07
	95.17
Oxygen (loss)	4.83
	100.00

PROSOPITE.

Two samples of prosopite have been analyzed by W. F. Hillebrand, as follows:

A. From St. Peters Dome, Pikes Peak district, Colorado. Described by Cross and Hillebrand in Bulletin 20. Specific gravity, 2.880 at 23°. Mean of four analyses.

B. Pale green, massive variety, from the Dugway mining district, Tooele County, Utah. Specific gravity, 2.87 at 21°. Described by Hillebrand in Bulletin 167.

	A.	B.
Al	22.02	20.08
Ca	17.28	17.55
Mg	.17	trace
K	----	.12
Na	.48	.32
Cu	----	.17
F	33.18	28.00
H_2O	13.46	14.24
	86.59	80.48
Oxygen (loss)	13.41	[a]19.52
	100.00	100.00

[a] Including a little quartz; undetermined.

TYSONITE.

From Cheyenne Mountain, near Pikes Peak, Colorado. Analyzed by W. F. Hillebrand and described by him in Bulletin 167. Corrected specific gravity, 6.14 at 28°.

Ce_2O_3 (includes 0.13 ThO_2?)	42.89
La_2O_3 group (at. wt. 139.7)	39.31
F	28.71
CO_2	.53
CaO	.18
Na_2O	.30
K_2O and Li_2O	traces
Fe_2O_3	.11
	112.03
Less O equivalent to F	12.08
	99.95

V. OXIDES AND HYDROXIDES.

SPINEL.

Variety pleonaste. Separated from a pyroxenite found between South Meadow and Moore creeks, Madison County, Mont. Rock described by Merrill in Proc. U. S. Nat. Mus., vol. 17, p. 659. Specific gravity of spinel, 3.89 at 32°.3. Analysis by L. G. Eakins.

Al_2O_3	62.09
FeO	17.56
MgO	15.61
Cr_2O_3	2.62
Fe_2O_3	2.10
MnO	trace
CaO	.16
SiO_2	.55
	100.69

GAHNITE.

From Gilmore's mica mine, Montgomery County, Md., about 12 miles north of Washington, D. C. Color, bottle-green. Specific gravity, 4.59. Analyzed by T. M. Chatard and described by him in Bulletin 9.

Al_2O_3	55.46
Fe_2O_3	2.77
ZnO	40.07
MgO	.59
CuO	undet.
SiO_2	.57
Ignition	.30
	99.76

MAGNETITE.

From the Gallatin Range, between Middle and Bozeman creeks, near Bozeman, Mont. Analysis by T. M. Chatard.

Insoluble	0.16
Fe_3O_4	96.70
Al_2O_3	.04
MnO	.93
CaO	trace
MgO	.07
TiO_2	2.71
P_2O_5	.012
S	.171
	100.793
Less O equivalent to S	.06
	100.733

CHROMITE.

From Corundum Hill, North Carolina. Analysis by T. M. Chatard. Fe_2O_3 not separately determined.

Cr_2O_3	45.94
FeO	42.90
Al_2O_3	2.51
MnO	.84
NiO, CoO	.16
CaO	1.40
MgO	2.81
CuO	.40
SiO_2	3.20
TiO_2	.36
P_2O_5	.12
	100.64

RUTILE.

From near St. Peters Dome, Pikes Peak district, Colorado. Specific gravity, 4.288 at 19°. Analysis by L. G. Eakins.

TiO_2	94.93
FeO	3.77
SiO_2	1.37
H_2O	.71
	100.78

DIASPORE.

From Mount Robinson, Custer County, Colo. Analysis by L. G. Eakins.

Al_2O_3	83.97
H_2O	15.43
	99.40

BAUXITE.

Two samples from Jacksonville, Calhoun County, Ala. Alkalies, lime, and magnesia not looked for. Analyses by W. F. Hillebrand.

	Red.	White.
Al_2O_3	41.00	48.92
Fe_2O_3	25.25	2.14
H_2O at 100°	.65	.45
H_2O by ignition	20.43	23.41
SiO_2	10.25	21.08
TiO_2	2.53	2.52
P_2O_5	trace	trace
	100.11	98.52

BRUCITE.

From Texas, Lancaster County, Pa. Analysis by E. A. Schneider:

MgO	67.97
MnO	.97
Fe_2O_3	.39
H_2O at 105°	.18
H_2O, ignition	30.63
	100.14

PSILOMELANE.

From a prospect hole on plain south of Round Mountain, Silver Cliff, Colo. Analysis by W. F. Hillebrand. There were strong spectroscopic reactions for strontia and lithia, but these bases were not estimated. A little insoluble gangue is included with the silica.

MnO_2	76.18
MnO	5.71
H_2O below 120°	1.41
H_2O above 120°	3.94
Al_2O_3	1.81
Fe_2O_3	.34
CoO	trace
ZnO	2.80
CaO	.83
MgO	.29
K_2O	3.46
Na_2O	.81
Sb_2O_5	.12
SiO_2	2.30
	100.00

VI. CARBONATES.

DOLOMITE.

A. Dolomite marble, New York Quarry Company, Tuckahoe, Westchester County, N. Y. Analysis by W. F. Hillebrand.

B. Dolomite marble, Cockeysville, Md. Analysis by J. E. Whitfield.

C. Same as B. Analysis by E. A. Schneider. Another sample.

D. Dolomite marble, Webster, Mass. Analysis by H. N. Stokes.

E. Pink, crystallized dolomite, Joplin, Mo. Analysis by E. T. Allen.

	A.	B.	C.	D.	E.
Insoluble	0.62		5.57		
SiO_2	.71	0.44		1.01	
Al_2O_3		1.22	.40	.17	
Fe_2O_3	.21			none	
FeO		trace		.37	0.90
MnO				.08	.06
MgO	20.71	20.87	20.30	21.35	19.65
CaO	30.68	30.73	29.08	30.82	32.05
CO_2	46.66	45.85	44.26	45.84	46.82
H_2O	.16	1.22		.09	.48
K_2O				.10	
Na_2O				.01	
P_2O_5				.06	
TiO_2				trace	
S				trace	
	99.75	100.33	99.61	99.90	99.96

SMITHSONITE.

From Marion County, Ark. Bright yellow variety, known locally as "turkey-fat ore." Analysis by H. N. Stokes.

SiO_2	0.06
ZnO	64.12
CdO	.63
CdS	.25
CO_2	34.68
CuO	trace
FeO	.14
CaO	.38
	100.26

BASTNÄSITE.

Associated with the tysonite of Cheyenne Mountain, near Pikes Peak, Colorado. Specific gravity, 5.12 at 27°. Analyzed by W. F. Hillebrand and described by him in Bulletin 167.

Ce_2O_3	[a] 37.71
La_2O_3 group	36.29
Fe_2O_3	.22
CO_2	20.03
Na_2O	.18
K_2O, Li_2O	traces
H_2O	.08
F	7.83
	102.34
O equivalent to F	3.30
	99.04

URAO.

Deposited from the waters of Owens Lake, California. Analyses by T. M. Chatard. Described by Chatard in Bulletin 60. Five samples analyzed, as follows:

A. The best material. Specific gravity, 2.1473 at 21.7°.
B. Crude urao.
C. Urao deposited upon a grass root.
D. From a small lagoon.
E. From a vat dug on the beach of Owens Lake.

	A.	B.	C.	D.	E.
Insoluble, inorganic	0.02	0.22	2.92	0.40	4.10
Insoluble, organic	------	------	.14	.12	.27
SiO_2	------	.10	.05	.09	.04
Cl	.19	1.57	2.73	.21	1.83
SO_3	.70	.79	.76	.63	.84
CO_2	38.13	37.00	35.24	37.50	35.10
Na_2O	41.00	41.26	40.22	40.08	39.36
K_2O	------	------	------	trace	------
CaO	------	------	------	.06	------
MgO	------	------	------	.02	------
H_2O	20.07	19.62	18.31	19.94	18.58
	100.11	100.56	100.37	99.05	100.12
O equivalent to Cl	.04	.35	.61	.05	.41
	100.07	100.21	99.76	99.00	99.71

[a] Includes 0.10 ThO_2.

VII. SILICATES.

PETALITE.

From Peru, Me., associated with spodumene. Analysis by F. W. Clarke.

Ignition	1.03
SiO_2	77.29
Al_2O_3	16.95
Fe_2O_3	trace
MnO	trace
Li_2O	2.62
Na_2O	2.39
K_2O	trace
	100.28

ORTHOCLASE AND MICROCLINE.

A. Orthoclase from Silver City, Idaho. Occurs as a gangue mineral. Partial analysis by W. F. Hillebrand.

B. Orthoclase from Mitchell County, N. C. Large cleavage mass. Analysis by E. T. Allen.

C. Feldspar crystal from the nevadite of Chalk Mountain, Summit County, Colo. Analysis by W. F. Hillebrand.

D. Pink orthoclase crystals, from gray porphyry, Johnson Gulch, near Leadville, Colo. Described by Cross in Monograph XII, Appendix A. Analysis by W. F. Hillebrand.

E. Feldspar separated from gabbro. East side of North Fowl Lake, Minnesota. Analysis by W. F. Hillebrand.

F. Feldspar from the elæolite-syenite of Litchfield, Me. Described by Bayley in Bulletin 150, p. 201. Analysis by W. H. Melville.

	A.	B.	C.	D.	E.	F.
SiO_2	66.28	65.09	65.04	62.22	62.71	65.14
TiO_2					trace	
Al_2O_3	17.93	18.95	20.40	20.33	19.20	18.19
Fe_2O_3		.36			1.08	
FeO					.93	.25
MnO					trace	
CaO		.42	.79	2.95	.44	.33
SrO					trace	
MgO		none	none		.81	.16
Na_2O	.25	2.29	4.11	3.45	2.96	1.68
K_2O	15.12	12.95	9.74	8.31	10.41	14.14
Li_2O			trace		none	
H_2O at 100°			.29	1.90	.23	.17
H_2O above 100°					.92	
	99.58	100.06	100.37	99.16	99.69	100.06

G. Flesh-colored microcline from the pegmatite of Jones Falls, Baltimore, Md.

H. Greenish microcline, same locality as G. G and H described by S. L. Powell in Johns Hopkins Univ. Circular, vol. 12, p. 49. Analyses by W. F. Hillebrand.

I. Anorthoclase from the elæolite-syenite of Peaked Butte, Crazy Mountains, Montana. See Wolff and Tarr in Bull. Mus. Comp. Zoöl., Harvard Coll., vol. 16, No. 12, 1893. Analysis by W. F. Hillebrand.

J. Anorthoclase from red soda-granite, Pigeon Point, Minnesota. Described by Bayley in Bulletin 109. Analysis by J. E. Whitfield.

K. Anorthoclase from keratophyre, Marblehead Neck, Massachusetts. Described by Sears, Bull. Mus. Comp. Zoöl., Harvard Coll., vol. 16, No. 9, 1893. Analysis by T. M. Chatard.

	G.	H.	I.	J.	K.
SiO_2	65.06	68.48	62.31	65.00	65.66
Al_2O_3	18.41	16.11	22.63	18.22	20.05
Fe_2O_3	trace	.20		2.64	trace
FeO		.17			trace
MnO					.13
MgO	.04	.03		.06	.18
CaO	.26	.23	.63	1.06	.67
SrO	trace	trace	.57		
BaO	.13	.05	.77		
K_2O	14.30	12.99	4.79	4.18	6.56
Na_2O	1.60	1.27	7.68	8.40	6.98
Li_2O	trace	trace			
H_2O at 100°	.04	.06	.16	.46	.04
H_2O above 100°	.26	.26	.72		.37
	100.10	99.85	100.26	100.02	100.64

ALBITE.

A. From feldspathic schist, central shaft of the Hoosac Tunnel, Berkshire County, Mass. Described by Wolff in Monograph XXIII, pp. 60–187. Analysis by R. B. Riggs.

B, C. From the porphyritic mica-schist of Greylock Mountain, Massachusetts. Described by Wolff, loc. cit. Analyses by R. B. Riggs.

D. From the clæolite-syenite of Litchfield, Me. Described by Bayley in Bulletin 150, p. 201. Specific gravity, 2.622. Analysis by W. H. Melville.

E. From the pegmatite of Jones Falls, Baltimore, Md. Described by S. L. Powell in Johns Hopkins Univ. Circular, vol. 12, p. 49. Analysis by W. F. Hillebrand.

	A.	B.	C.	D.	E.
SiO_2	69.69	68.08	67.83	68.28	63.72
Al_2O_3	18.60	20.11	19.92	19.62	22.26
Fe_2O_3					
FeO				.23	
MgO	.20	(?)	(?)	.09	.06
CaO	trace	trace	trace	.31	3.58
SrO					trace
Na_2O	10.28	11.00	11.65	10.81	8.98
K_2O	.40	.36	.25	.39	.76
Li_2O					trace
MnO		trace	trace		
H_2O below 100°	.42	.31	.12	.09	.09
H_2O above 100°					.43
	99.59	99.86	99.77	99.82	99.88

ANORTHITE.

A. From Raymond, Me. Associated with idocrase, garnet, pyroxene, and scapolite. Analysis by W. H. Melville.

B. From Phippsburg, Me. Occurrence similar to A. Incomplete analysis by George Steiger.

C. Separated from "hyperite changing to diorite," near Whitaker's ore pit, Wilmington, Del. Described by Chester in Bulletin 59. Analysis by R. B. Riggs.

	A.	B.	C.
SiO_2	43.13	45.62	44.09
Al_2O_3	30.95	35.29	35.41
Fe_2O_3	1.04		.51
FeO	trace		
MnO	trace		
CaO	19.71	17.31	18.47
MgO	.31		none
K_2O	1.29		.19
Na_2O	.69		.99
Li_2O	trace		
H_2O at 100°	.22		.35
H_2O above 100°	2.80		
	100.14	98.22	100.01

SODA-LIME FELDSPARS.

A. Transparent oligoclase, from Bakersville, N. C. Analysis by F. W. Clarke.

B. Feldspar separated from porphyrite; Sugar Loaf, northwest of Elk Mountain, Tenmile district, Summit County, Colo. Analysis by W. F. Hillebrand. Much altered.

C. Feldspar separated from andesite; mesa northwest of Parkdale, Colo. Analysis by W. F. Hillebrand.

D. Feldspar separated from gabbro; Brandywine Creek, Wilmington, Del. Specific gravity, 2.592–2.877. Described by Chester in Bulletin 59. Analysis by R. B. Riggs.

E. Feldspar separated from the gabbro of Ashland County, Wis. Analysis by W. F. Hillebrand.

F. Feldspar separated from diabase; near SE. corner of sec. 13, T. 47 N., R. 46 W., Michigan. Described by Van Hise in Monograph XIX. Analysis by T. M. Chatard.

	A.	B.	C.	D.	E.	F.
SiO_2	62.92	62.96	63.02	70.37	53.30	51.18
TiO_2					trace	
Al_2O_3	25.32	21.51	23.05	18.36	29.03	27.00
Fe_2O_3	trace			.58	.55	3.19
FeO		.32		undet.	.23	undet.
CaO	4.03	4.00	3.39	5.08	11.40	11.70
SrO		.13	trace		trace	
BaO					trace	
MgO		.30	trace	.04	.13	1.92
MnO	trace			trace	none	.17
K_2O	.96	1.60	3.92	.63	.40	.41
Na_2O	6.18	6.15	6.76	4.32	4.87	3.48
Li_2O		trace	none		none	
P_2O_5					trace	
H_2O	.25	2.78	.26	.45	.23	1.19
	99.66	99.75	100.40	99.83	100.14	100.24

G, H. Feldspars separated from olivine-diabase; NE. ¼ sec. 13, T. 45 N., R. 1 W., Wisconsin. See Van Hise, Monograph XIX. Analyses by T. M. Chatard.

I. Feldspar from gabbro; southern half of sec. 14, T. 44 N., R. 4 W., Wisconsin. See Van Hise, loc. cit. Analysis by T. M. Chatard.

The following feldspars were separated from Minnesota gabbros for W. S. Bayley and analyzed by W. F. Hillebrand:

J. From average gabbro, south quarter post, sec. 35, T. 61 N., R. 12 W.

K. From gabbro, NW. ¼ of SE. ¼ sec. 23, T. 62 N., R. 10.

L. From gabbro, center of sec. 25, T. 64 N., R. 8.

M. From gabbro, Duluth and Iron Range Railroad.

N. O. Two feldspars separated from the amphibolite of Palmer Center, Mass. Analyses by W. F. Hillebrand. Specific gravity of N, 2.667 at 24°; of O, 2.677 at 22°. In N, calculation gives about 7.4 and in O 7.6 per cent of admixed quartz.

	G.	H.	I.	J.	K.
SiO_2	61.65	56.15	51.99	51.89	52.50
Al_2O_3	19.91	26.05	29.32	29.68	30.15
Fe_2O_3	2.28	1.98	1.23	.32	.47
FeO	undet.	undet.		.37	.15
MnO	trace	.13	trace	----	----
CaO	4.12	8.70	12.60	12.62	12.82
MgO	.61	.54	.63	.38	.10
Na_2O	4.74	4.79	2.91	3.87	3.72
K_2O	5.72	1.56	.28	.50	.53
H_2O at 100°	.95	.13	.03	.07	.25
H_2O above 100°		.64	.54	.39	
TiO_2	----	----	----	----	trace
	99.98	100.67	99.53	100.09	100.69

	L.	M.	N.	O.
SiO_2	52.61	53.45	62.91	60.90
Al_2O_3	29.80	29.77	23.37	24.97
Fe_2O_3	.57	.33	trace	trace
FeO	.23	.15	----	----
CaO	12.25	11.33	5.83	7.85
MgO	.20	.11	----	----
Na_2O	3.80	4.33	7.78	6.26
K_2O	.53	.68	.20	.16
H_2O at 100°	.29	.23	.42	.48
H_2O above 100°				
TiO_2	trace	trace	trace	trace
MnO	trace	----	----	----
	100.28	100.38	100.51	100.62

LEUCITE.

From Mount Vesuvius. A fine crystal. Analysis by George Steiger.

SiO_2	55.40
Al_2O_3	23.69
CaO	.16
K_2O	19.54
Na_2O	1.25
H_2O	.24
	100.28

ENSTATITE.

A. Enstatite from Granville, Mass. Slightly altered. Described by Emerson in Monograph XXIX. Analysis by W. F. Hillebrand.

B. Enstatite separated from the San Emigdio meteorite, found in San Bernardino County, Cal. Analysis by J. E. Whitfield.

C. White, fibrous mineral, near enstatite, from seams in chrysolite rock, Corundum Hill, North Carolina.

D. Altered enstatite, Corundum Hill. Analyses C and D by T. M. Chatard. (See Bulletin 42.) Specific gravity, 2.872.

E. Bronzite separated from the websterite of Hebbville, Md. Described by Williams in Am. Geologist, vol. 6, p. 35. Analysis by T. M. Chatard.

	A.	B.	C.	D.	E.
SiO_2	54.04	54.42	56.39	56.58	54.53
TiO_2	none	.....	none	none	undet.
Al_2O_3	.52	.....	2.31	1.74	1.93
Fe_2O_3	1.51	.....	.16	1.89	1.70
FeO	3.90	14.03	1.96	3.67	8.92
MnO	.11	.....	.....	.21	.28
NiO	.23	.....	.....	.....	.....
Cr_2O_3	.14	.....	.....	.24	.30
MgO	34.40	29.11	34.57	30.34	29.51
CaO	none	2.46	.04	.59	2.25
Alkalies	.08	.....	.....	.17	.....
P_2O_5	none	.....	.....	.....	trace
CO_2	1.32	.....	.....	.....	.....
H_2O at 100°	.70	.....	4.32	4.55	1.14
H_2O above 100°	3.07	.....			
	100.02	100.02	99.75	99.98	100.56

HYPERSTHENE.

A. From the basalt of Mount Thielsen, Oregon. Incomplete analysis by T. M. Chatard.

B. From gabbro, SE. ¼ sec. 20, T. 65 N., R. 4 W., Minnesota. Described by Bayley in Jour. Geol., vol. 3, p. 1. Analysis by E. A. Schneider.

C. From the augite-andesite of the Tokajer-Berg, Hungary. Analysis by W. F. Hillebrand. Specific gravity, 3.495 at 25°.

D, E, F. Three specimens separated from the hypersthene-andesite of the Buffalo Peaks, Colorado. Described by Cross in Bulletin 1. Analyses by W. F. Hillebrand. In D and E alkalies were disregarded. In E and F all the iron is given as FeO. Specific gravity of F, 3.307 at 23°.

	A.	B.	C.	D.	E.	F.
SiO_2	53.31	48.44	51.44	51.70	51.16	50.04
TiO_2		undet.	.73			
Al_2O_3	5.99	7.91	.60	1.72	2.15	2.91
Fe_2O_3	}	.33	2.28	.30	}	}
FeO	} 13.43	20.88	20.77	18.00	} 18.36	} 17.81
MnO		.92	.88	.36	.36	.12
MgO	21.69	19.35	19.93	25.09	24.25	21.74
CaO	3.69	1.44	3.80	2.87	3.81	6.70
Na_2O						.27
H_2O at 100°		.08				
H_2O above 100°		none				
	98.11	99.35	100.43	100.04	100.09	99.59

PYROXENES.

A. Diopside separated from the websterite of Hebbville, Md. Described by G. H. Williams, Am. Geologist, vol. 6, p. 35. Analysis by T. M. Chatard.

B. Diopside from the leucite rocks of the Leucite Hills, Wyoming. Described by Cross, Am. Jour. Sci., 4th ser., vol. 4, p. 115. Specific gravity, 3.290 at 20°. Analysis by W. F. Hillebrand.

C. Pyroxene from Moriah, N. Y. The source of associated serpentine. Analysis by Charles Catlett.

D. Dark-gray pyroxene, Montville, N. J. The source of associated serpentine. Analysis by Charles Catlett.

E. Diallage from the gabbro of Ashland County, Wis. Analysis by W. F. Hillebrand.

F. Jeffersonite from Franklin Furnace, N. J. Analyzed by W. F. Hillebrand and described by him in Bulletin 167.

	A.	B.	C.	D.	E.	F.
SiO_2	51.80	50.86	55.36	51.45	49.80	51.70
TiO_2	.13	3.03	.....	.....	1.29	.....
Al_2O_3	2.21	.....	.22	2.94	2.86	.36
Cr_2O_3	.51	.....	none	.....	.....	.....
Fe_2O_3	1.29	1.19	.18	1.06	2.48	.37
FeO	3.50	1.82	.57	.96	10.82	.....
MnO	trace	.03	trace	trace	.37	7.43
ZnO	.....	.....	.....	.....	.....	3.31
MgO	17.76	17.42	19.53	18.43	15.33	12.57
CaO	20.99	23.32	24.48	24.02	16.50	23.68
Na_2O	undet.	.76	.....	.....	.51	.12
K_2O	undet.	.42	.....	.....	.12	trace
P_2O_5	trace	.....	.....	.....	trace	.....
H_2O	.65	.31	.....	1.08	.33	.65
	98.84	99.16	100.34	99.94	100.41	100.19

G. Augite from nepheline-basalt, Black Mountain, Uvalde quadrangle, Texas. Violet colored. Analysis by W. F. Hillebrand.

H. Augite from dolerite dike, near Valmont, Colo. See Cross, Monograph XXVII. Analysis by L. G. Eakins.

I. Augite from tinguaite, Two Buttes, Colo. Specific gravity, 3.43 at 28°. Analysis by W. F. Hillebrand.

J. Pyroxene from syenitic lamprophyre, Two Buttes, Colo. Specific gravity, 3.45 at 25°. Analysis by W. F. Hillebrand.

K. Augite from granite, north end of Blue Mountains, Silver Cliff, Colo. Specific gravity, 3.225 at 18°. Analysis by L. G. Eakins.

L. Augite from the Golden King dike, Silver Cliff, Colo. Specific gravity, 3.281 at 13°. Analysis by L. G. Eakins.

M. Pyroxene from norite, dike east of Sugar Loaf, Boulder County, Colo. Analysis by L. G. Eakins.

	G.	H.	I.	J.	K.	L.	M.
SiO_2	45.23	49.10	47.54	51.27	48.72	54.87	47.32
TiO_2	4.28	.....	3.00	.70	.....	.....	.....
ZrO_2	.....	.....	none	none	.....	.....	.....
Al_2O_3	7.73	7.95	4.14	3.05	9.27	6.34	6.37
Cr_2O_3	.....	.....	trace?	none	.....	.....	.....
Fe_2O_3	2.95	.....	5.64	3.08	3.77	2.88	2.56
FeO	4.07	8.30	6.42	4.34	6.34	4.61	14.40
MnO	.07	.....	.36	.28	.34	.14	.....
MgO	12.25	12.37	10.05	14.21	14.67	14.47	13.43
CaO	23.37	22.54	21.57	22.58	16.79	15.87	16.08
Na_2O	.47	trace	1.38	.67	.19	.28	.....
K_2O	.12	trace	.12	.06	.....	.....	.....
Li_2O	trace	.....	trace	.....	.....	.....	.....
BaO	none	.....	none	none	.....	.....	.....
SrO	none	.....	none	none	.....	.....	.....
NiO	.05	.....	trace	.03	.....	.....	.....
P_2O_5	none	.....	.....	.....	.....	.....	.....
H_2O	.37	.....	undet.	undet.	.18	.31	.....
	100.96	100.26	100.22	100.27	100.27	99.77	100.16

N. Pyroxene from Italian Mountain, Gunnison County, Colo. Associated with idocrase, scapolite, garnet, epidote, etc. Analysis by L. G. Eakins. Specific gravity, 3.312 at 16.7°.

O. Augite from basalt, 6 miles northeast of Grants, Mount Taylor region, New Mexico. Analysis by T. M. Chatard.

P. Pyroxene from peridotite, east of Fort Ellis, Mont. Partial analysis by F. W. Clarke.

Q. Pyroxene from basalt, east side of Bozeman Creek, 2½ miles southeast of Bozeman, Mont. Described by Merrill, Proc. U. S. Nat. Mus., vol. 17, p. 637. Analysis by L. G. Eakins.

	N.	O.	P.	Q.
SiO_2	47.53	47.06	51.95	52.50
TiO_2	------	1.82	------	------
Al_2O_3	9.88	7.77	4.21	2.26
Cr_2O_3	------	trace	------	1.07
Fe_2O_3	1.79	1.30	------	2.05
FeO	.91	8.15	5.90	2.47
MgO	trace	.20	undet.	trace
NiO,CoO	------	trace	------	------
MgO	14.43	13.52	13.81	17.11
CaO	25.46	19.33	23.32	21.70
Na_2O	trace	.33	------	.35
K_2O	------	.11	------	.07
P_2O_5	------	.06	------	------
H_2O	.30	.20	undet.	.64
	100.30	99.85	99.19	100.22

ÆGIRITE.

From Magnet Cove, Arkansas. Analysis by George Steiger.

SiO_2	50.45
Al_2O_3	2.76
Fe_2O_3	23.42
FeO	5.26
MnO	.10
MgO	1.48
CaO	5.92
Na_2O	9.84
K_2O	.24
H_2O at 100°	.15
H_2O above 100°	.40
	100.02

JADEITE.

The following analyses of jadeite, all by F. W. Clarke, were discussed by Clarke and Merrill in the Proceedings of the United States National Museum for 1888. They all represent worked material.

A. Light-colored bead, mottled with emerald green, from State of Oaxaca, Mexico. Specific gravity, 3.007, determined by William Hallock.

B. Carved head, light green, from Zaachita, Oaxaca. Specific gravity, 3.190, Hallock.

C. Fragment from Sardinal, Costa Rica; pale green, translucent. Specific gravity, 3.32, Clarke.

D. Fragment from Culebra, Costa Rica; light green, granular, opaque; quite impure. Specific gravity, 3.27, Clarke.

	A.	B.	C.	D.
SiO_2	58.88	58.18	59.18	58.33
Al_2O_3	25.93	23.53	22.96	21.63
Cr_2O_3	.12			
Fe_2O_3	}	}	}	1.71
FeO	.24	1.67	1.87	.73
MgO	.36	1.72	.67	3.09
CaO	.40	2.35	1.52	4.92
Na_2O	11.64	11.81	12.71	8.13
K_2O	.63	.77	trace	.22
Ignition	1.81	.53	.90	.93
	100.01	100.56	99.81	99.69

WOLLASTONITE.

Compact variety, from Diana, N. Y. Partial analysis by E. A. Schneider:

SiO_2	50.05
Al_2O_3, Fe_2O_3	1.13
CaO	47.10
MgO	.09
H_2O	.45
	98.82

PECTOLITE.

A. Stone hammer, at first supposed to be jade, collected among the Eskimo of Point Barrow, Alaska. Analyzed by F. W. Clarke, and described by him in Bulletin 9. Pale apple-green, tough, compact, highly polished. Specific gravity, 2.873.

B. Radiated pectolite from Bergen Hill, New Jersey. Analyzed by E. A. Schneider.

C. Another sample from Bergen Hill. Analysis by George Steiger.

	A.	B.	C.
SiO_2	53.94	53.11	53.34
$Al_2O_3+Fe_2O_3$	.58	.40	.33
MnO	----	.81	.45
CaO	32.21	33.88	33.23
MgO	1.43	----	----
Na_2O	8.57	8.62	9.11
CO_2	----	----	.67
H_2O at 105°	4.09	.04	.27
H_2O, 250°–300°		.14	2.70
H_2O, red heat		2.86	
	100.82	99.86	100.10

AMPHIBOLE.

A. Tremolite, pseudomorphous after sahlite; northeast slope of Canaan Mountain, Connecticut. Analysis by W. F. Hillebrand.

B. Tremolite, found in the serpentine of Easton, Pa. Analysis by L. G. Eakins.

C. Actinolite (?), Corundum Hill, North Carolina. Specific gravity, 3.062. Analyzed by T. M. Chatard and described by him in Bulletin 42.

D. Nephrite, New Zealand. Fragment from a dark-green bowlder. Analysis by F. W. Clarke.

E. Nephrite, Robenhausen, Lake Pfäffikon, Switzerland. Part of a green, compact, highly polished jade implement. Specific gravity, 3.015; determined by William Hallock. Analysis by F. W. Clarke.

	A.	B.	C.	D.	E.
SiO_2	57.97	58.27	55.23	56.73	56.87
TiO_2	none	------	none	------	------
Al_2O_3	.09	.33	3.04	3.22	1.50
Cr_2O_3	------	------	.19	------	------
Fe_2O_3	.11	trace	1.88	}	
FeO	.18	------	2.51	} 5.96	6.33
MnO	trace	.08	.26	trace	trace
NiO, CoO	------	------	trace	------	------
CaO	15.05	11.90	13.36	13.24	13.45
SrO	trace	------	------	------	------
MgO	22.45	25.93	22.31	19.42	21.06
K_2O	.12	.42	} .58	undet.	undet.
Na_2O	.20	1.25	}	undet.	undet.
H_2O at 100°	.03	} 1.22	.04	} .83	} .63
H_2O above 100°	2.57	}	.52	}	}
CO_2	1.69	------	------	------	------
	100.46	99.40	99.92	99.40	99.84

F. Dark-green nephrite implement, from the Eskimo of Point Barrow, Alaska. Specific gravity, 3.012. Analysis by F. W. Clarke.

G. Nephrite adze, Point Barrow. Nearly black, with grayish-green patches. Specific gravity, 2.922, Hallock. Analysis by F. W. Clarke.

H. Nephrite adze, Cape Prince of Wales, Alaska. Dark green, laminated in two shades, opaque. Specific gravity, 2.989, Hallock. Analysis by F. W. Clarke.

I. Worked nephrite, St. Michael, Alaska. Dull apple green, fairly uniform in tint, semitranslucent at edges. Specific gravity, 3.006, Hallock. Analysis by F. W. Clarke.

J. Jade implement, Diomede Island, Alaska. Dark green, laminated in two shades, opaque. Specific gravity, 3.010, Hallock. Analysis by F. W. Clarke.

	F.	G.	H.	I.	J.
SiO_2	57.01	57.11	56.01	56.12	55.08
Al_2O_3	.42	2.57	1.98	.63	1.01
FeO	6.95	5.15	6.34	7.45	7.67
CaO	12.75	11.54	12.54	12.72	13.35
MgO	21.36	21.38	21.57	20.92	19.96
MnO	.....	trace	trace	trace	trace
Ignition	1.41	2.06	1.91	1.42	2.03
Alkalies	undet.	undet.	undet.	undet.	undet.
	99.90	99.81	100.35	99.26	100.10

K, L, M, N. Four samples of nephrite, found in situ by Lieutenant Stoney, U. S. Navy, near the Kowak River, Alaska. K, greenish gray, splintery-lamellar. L, like K, but more granular. M, paler, nearly white, closer grained. N, brownish, highly foliated. Analyses by F. W. Clarke. Ferrous iron determinations by R. B. Riggs. O, Nephrite from Jordansmühl, Silesia; analysis by George Steiger; typical material from an old locality. For details concerning nephrites D to N, see the memoir by Clarke and Merrill in Proc. U. S. Nat. Mus. for 1888.

	K.	L.	M.	N.	O.
SiO_2	58.11	55.87	56.85	57.38	56.39
TiO_2	------	------	------	------	none
Al_2O_3	.24	2.07	.88	.19	1.63
Fe_2O_3	5.44	5.79	4.33	4.43	1.72
FeO	.38	.38	1.45	1.25	3.70
MnO	trace	trace	trace	trace	.26
NiO	------	------	------	------	.13
CaO	12.01	12.43	13.09	12.14	7.92
MgO	21.97	21.62	21.56	22.71	24.63
Alkalies	undet.	undet.	undet.	undet.	none
P_2O_5	------	------	------	------	trace
H_2O at 100°	1.78	1.38	1.76	1.73	.65
H_2O above 100°					3.42
	99.93	99.54	99.92	99.83	100.45

P. Brown hornblende, Pierrepont, N. Y. Analysis by T. M. Chatard.

Q. Hornblende separated from gabbro, east shaft of waterworks extension, Washington, D. C. Analysis by R. B. Riggs.

R. Amphibole from the serpentine of Montville, N. J. Analysis by L. G. Eakins.

S. Hornblende separation, from south of soapstone quarry, Warwick, Mass. Analysis by E. A. Schneider.

T. Hornblende from amphibolite dike, Palmer Center, Mass. Specific gravity, 3.220 at 31.5°. Analysis by W. F. Hillebrand.

U. Hornblende from amphibolite bed, same locality and analyst. Specific gravity, 3.217 at 29°.

	P.	Q.	R.	S.	T.	U.
SiO_2	56.44	52.42	43.31	47.86	43.11	44.09
TiO_2	.11	------	------	[a].63	1.32	1.73
Al_2O_3	1.77	3.15	17.41	14.09	11.10	10.68
V_2O_3	------	------	------	------	.07	undet.
Cr_2O_3	------	------	------	------	trace	trace
Fe_2O_3	.84	3.60	.71	.33	4.97	2.72
FeO	.73	8.36	.59	13.41	13.04	12.96
MnO	.11	.11	.14	.14	.43	.32
NiO	------	------	------	------	trace	trace
CaO	11.83	14.33	12.84	.57	11.76	11.58
MgO	22.98	15.85	19.39	19.89	9.35	10.75
K_2O	.75	.12	1.36	.06	1.27	.88
Na_2O	2.13	1.16	2.23	.93	1.18	1.19
H_2O at 100°	.05	1.25	1.17	none	.16	.21
H_2O above 100°	2.41			2.46	1.92	1.91
P_2O_5	trace	------	------	.05	.10	.10
	100.15	100.35	99.15	100.42	99.78	99.12

[a] Admixed rutile.

V. Hornblende near barkevikite. Separated from the sodalite-syenite of Square Butte, Highwood Mountains, Montana. Described by Lindgren in Am. Jour. Sci., 3d ser., vol. 45, p. 286. Analysis by W. H. Melville.

W. Amphibole separated from quartz-diorite, south of Table Mountain, on ridge between Butte and Plumas counties, Cal. Described by Turner in Seventeenth Annual Report, Part I, p. 521. Analysis by William Valentine. Chromium determination by Hillebrand.

X. Amphibole separated from amphibole gabbro, Beaver Creek, Big Trees quadrangle, California. Analysis by William Valentine. See Bulletin 168, p. 206.

Y. Amphibole separated from quartz-monzonite, Tioga road, southeast of Mount Hoffman, Mariposa County, Cal. Specific gravity, 3.203 at 21.5.° Analysis by W. F. Hillebrand. See Bulletin 168, p. 208.

Z. Amphibole separated from the granite of Butte, Mont. Incomplete analysis for lack of material. Analysis by H. N. Stokes.

	V.	W.	X.	Y.	Z.
SiO_2	38.41	50.08	46.08	47.49	45.73
TiO_2	------	.76	.77	1.21	1.43
Al_2O_3	17.65	7.97	10.56	7.07	6.77
V_2O_3	------	------	------	.04	------
Cr_2O_3	------	.16	------	none	none
Fe_2O_3	3.75	2.69	2.81	4.88	4.94
FeO	21.75	6.71	8.30	10.69	10.39
MnO	.15	.49	.15	.51	.54
NiO	trace	------	------	.02	------
CaO	10.52	11.21	12.64	11.92	11.25
MgO	2.54	16.31	14.40	13.06	12.32
Na_2O	2.95	1.22	1.62	.75	.77
K_2O	1.95	.46	.34	.49	1.22
Li_2O	------	------	none	trace	trace
H_2O at 100°	------	------	.17	------	.49
H_2O above 100°	.24	1.40	1.97	1.86	2.29
P_2O_5	------	trace	.18	none	.35
F	------	undet.	none	.06	.28
	99.91	99.46	99.99	100.05	98.77
O equivalent to F	------	------	------	.02	.12
	------	------	------	100.03	98.65

BERYL.

A. White beryl from the tin mine at Winslow, Me. Opaque, milky. associated with mica, fluorite, calcite, tinstone, etc. Specific gravity, 2.707 at 27°. Analysis by W. F. Hillebrand.

B. Green beryl from near Home post-office in eastern Tennessee. Analysis by F. W. Clarke.

	A.	B.
SiO_2	65.21	65.39
TiO_2	trace	----
Al_2O_3	18.50	19.10
Fe_2O_3	.33	
FeO		----
GlO	13.03	13.35
K_2O, Cs_2O	.14	----
Na_2O	.87	----
Li_2O	.16	----
MgO	.09	----
H_2O	1.80	1.76
	100.13	99.60

NEPHELITE.

A. Elæolite from Litchfield, Me. Dark-gray cleavable masses, of greasy luster. Described by F. W. Clarke in Bulletin 42.

B. Another sample from Litchfield. Analysis by George Steiger.

C. Nephelite extracted by solution from the elæolite-syenite of Red Hill, N. H. Described by Bayley in Bull. Geol. Soc. America, vol. 3, p. 231. Analysis by W. F. Hillebrand.

	A.	B.	C.
SiO_2	43.74	45.91	45.31
Al_2O_3	34.48	31.14	32.67
Fe_2O_3	----	.34	----
FeO	----	.23	----
MgO	----	----	.16
CaO	trace	.33	2.00
Na_2O	16.62	14.60	12.60
K_2O	4.55	5.60	5.70
H_2O at 100°	.86	.47	----
H_2O above 100°		.93	1.56
CO_2	----	.40	----
	100.25	99.95	100.00

CANCRINITE.

All from Litchfield, Me. See description by Clarke in Bulletin 42.

A. Pale yellow, granular.

B. Bright orange-yellow, cleavable, transparent in thin fragments.

C. Dingy pale yellow, otherwise like B.

D. Average yellow sample.

E. Flesh-colored, cleavable mixture of elæolite and cancrinite. Analysis D by George Steiger; the others by F. W. Clarke. CO_2 determinations in A, B, C, E by R. B. Riggs.

	A.	B.	C.	D.	E.
SiO_2	37.22	36.29	35.83	36.19	38.93
Al_2O_3	28.32	30.12	29.45	29.24	32.52
Fe_2O_3	trace	trace	trace	trace	.....
MnO	trace	trace	trace	.....	trace
CaO	4.40	4.27	5.12	4.72	2.47
MgO	.07	.....	.....	.....	none
Na_2O	19.43	19.56	19.33	19.20	17.02
K_2O	.18	.18	.09	.14	3.23
H_2O	3.86	2.98	3.79	4.15	2.83
CO_2	6.22	6.96	6.50	6.11	2.95
	99.70	100.36	100.11	99.75	99.95

SODALITE.

A. Blue sodalite, from Litchfield, Me. Analysis by F. W. Clarke. See description in Bulletin 42.

B. Blue sodalite, from Ice River, near Kicking Horse Pass, British Columbia. Analysis by George Steiger.

C. Sodalite separated from the sodalite-syenite of Square Butte, Highwood Mountains, Montana. See Lindgren in Am. Jour. Sci., 3d ser., vol. 45, p. 286. Specific gravity, 2.265. Analysis by W. H. Melville.

	A.	B.	C.
SiO_2	37.33	39.66	41.56
Al_2O_3	31.87	30.09	29.48
Fe_2O_3	----------	.31	----------
FeO	----------	----------	.49
MgO	----------	----------	.15
CaO	----------	.18	.49
Na_2O	24.56	22.60	19.21
K_2O	.10	1.14	.91
H_2O at 100°	1.07	.17	.45
H_2O above 100°		.79	3.73
Cl	6.83	6.12	4.79
	101.76	101.06	101.26
O equivalent to Cl	1.54	1.39	1.08
	100.22	99.67	100.18

ZUNYITE.

From the Zuñi mine, Anvil Mountain, near Silverton, Colo. Analyzed by W. F. Hillebrand, and described by him as a new species in Bulletin 20. Specific gravity, 2.875 at 15°.

SiO_2	24.33
Fe_2O_3	.20
Al_2O_3	57.88
K_2O	.10
Na_2O	.24
Li_2O	trace
H_2O	10.89
P_2O_5	.60
F	5.61
Cl	2.91
	102.76
O equivalent to F and Cl	3.02
	99.74

GARNET.

A. Grossularite. Large waterworn pebble, pale green, very compact. At first, thought to be jade. From Eltoro, 40 miles south of Los Angeles, Cal. Described by Clarke in Am. Jour. Sci., 3d ser., vol. 50, p. 76. Analysis by George Steiger. Specific gravity, 3.485.

B, C, D. Three samples of garnet from Italian Mountain, Gunnison County, Colo. Specific gravities: A, 3.72 at 16°; B, 3.629 at 23°; C, 3.721 at 17.2°. Analyses by L. G. Eakins.

E. Pyrope from the peridotite dike of Elliott County, Ky. Described by Diller in Bulletin 38. Analysis by T. M. Chatard.

F. Garnets from Hawkes's quarry, Goshen, Mass. Almandite. Analysis by George Steiger.

	A.	B.	C.	D.	E.	F.
SiO_2	37.54	37.89	39.26	36.88	41.32	37.30
TiO_2	trace	----	----	----	.16	.24
Al_2O_3	22.84	7.90	19.63	10.34	21.21	21.84
Cr_2O_3	----	----	----	----	.91	----
Fe_2O_3	.79	16.43	4.48	17.51	4.21	.98
FeO	.26	----	----	----	7.93	32.62
MnO	----	----	trace	----	.34	1.86
CaO	36.66	35.43	36.61	34.85	4.94	3.19
MgO	.44	.59	trace	.43	19.32	2.50
Na_2O	.13	1.10	.16	trace	.07	----
K_2O		trace	trace	----	----	----
H_2O	1.74	.36	.08	.21	.17	----
P_2O_5	trace	----	----	----	none	----
	100.40	99.70	100.22	100.22	100.58	100.53

G. Spessartite from Amelia Court House, Amelia County, Va. Pale brown, crystalline masses. Analyzed by F. W. Clarke and described in Bulletin 60.

H. Spessartite from Llano County, Tex. Yellow, granular. Analyzed by W. H. Melville and described in Bulletin 90. FeO could not be separately determined.

I. Spessartite from cavities in rhyolite, Nathrop, Colo. Brilliant crystals. Specific gravity, 4.23 at 18°. Described by Cross in Am. Jour. Sci., 3d ser., vol. 31, p. 432. Analysis by L. G. Eakins.

J. Garnet from the Peacock mining claim, Seven Devils mining district, Idaho. Associated with bornite and powellite. Analyzed by W. H. Melville and described in Bulletin 90.

K, L. Two samples andradite from Clifton, Ariz. Analyses by George Steiger.

	G.	H.	I.	J.	K.	L.
SiO_2	35.35	35.93	35.66	38.67	36.26	42.63
TiO_2	------	trace	------	------	none	none
Al_2O_3	20.41	18.08	18.55	10.08	.78	1.53
Fe_2O_3	2.75	4.60	.32	16.00	32.43	31.41
FeO	1.75		14.25	.91	.32	.30
MnO	38.70	31.77	29.48	------	.27	.43
CaO	.94	8.48	1.15	33.35	29.67	23.37
BaO	------	trace	------	------	------	------
MgO	none	.69	------	.77	none	none
Na_2O	------	.17	.21	------	none	------
K_2O	------		.27	------	none	------
CuO	------	------	------	trace	------	------
P_2O_5	------	none	------	------	.06	trace
H_2O at 100°	.27	.03	.44	.06	.13	------
H_2O above 100°		.36			.44	------
	100.17	100.11	100.33	99.84	100.36	99.67

CHRYSOLITE.

A. Transparent green pebbles from near Fort Wingate, N. Mex. Analysis by E. A. Schneider.

B. Transparent olivine from the meteorite of Kiowa County, Kans. Described in Bulletin 78. Specific gravity, 3.376 at 23.2°. Analysis by L. G. Eakins.

C. Olivine from the peridotite dike of Elliott County, Ky. Described by Diller in Bulletin 38. Analysis by T. M. Chatard.

D. Olivine from the peridotite at Riddle, Oreg. The rock is the matrix of nickel silicates. Described by Diller and Clarke in Bulletin 60. Analysis by F. W. Clarke.

E. Olivine from olivine-gabbro, west side of Birch Lake, Minnesota. Described by Bayley, Jour. Geol., vol. 1, p. 688. Analysis by W. F. Hillebrand.

	A.	B.	C.	D.	E.
SiO_2	41.98	40.70	40.05	42.81	35.58
TiO_2	------	------	.07	------	1.22
Al_2O_3	------	trace?	.39	------	.92
Cr_2O_3	------	------	.24	.79	trace
Fe_2O_3	.51	.18	2.36	2.61	}
FeO	5.71	10.79	7.14	7.20	} 33.91
MnO	.10	.14	.20	------	.35
NiO	.42	.02	------	.26	} .20
CoO	------	------	trace	------	}
MgO	51.11	48.02	46.68	45.12	26.86
CaO	------	------	1.16	none	.90
Na_2O	------	------	.08	------	------
K_2O	------	------	.21	------	------
H_2O at 100°	.05	------	.14	} .57	.11
H_2O above 100°	.23	------	.66	}	.20
P_2O_5	------	------	.04	------	------
	100.11	99.85	99.42	99.36	100.25

MIZZONITE.

From a gulch on the side of Italian Mountain, Gunnison County, Colo. Analysis by L. A. Eakins.

SiO_2	57.55
Al_2O_3	21.53
Fe_2O_3	trace
CaO	6.18
K_2O	1.64
Na_2O	7.43
H_2O	3.23
Cl	2.82
	100.38
O equivalent to Cl	.63
	99.75

VESUVIANITE.

A. Finely crystallized material from Italian Mountain, Gunnison County, Colo. Analysis by L. G. Eakins. Specific gravity, 3.394 at 20°.

B. From Nevada, 24 kilometers northeast of Silver Peak. Analysis by George Steiger.

C. Pale green, massive. South Fork of Indian Creek, 12 miles from Happy Camp, Siskiyou County, Cal. Analysis by George Steiger.

	A.	B.	C.
SiO_2	37.11	36.80	35.86
TiO_2	----------	.66	.10
Al_2O_3	19.30	17.53	18.35
Fe_2O_3	3.31	1.56	1.67
FeO	----------	3.27	.39
MnO	----------	.48	.05
MgO	3.89	1.23	5.43
CaO	36.24	35.00	33.51
Alkalies	----------	.13	none
H_2O at 100°	.06	.10	.29
H_2O above 100°		1.56	4.18
P_2O_5	----------	.07	.02
CO_2	----------	.65	none
F	.58	.88	none
	100.49	99.92	99.85
O equivalent to F	.24	.36	----------
	100.25	99.56	----------

ZOISITE.

A. Zoisite from gabbro, east shaft of waterworks extension, Washington, D. C. Analysis by F. W. Clarke; iron determination by R. B. Riggs.

B. Rose-red zoisite, James's mica mine, Yancey County, N. C. Specific gravity, 3.352 at 27°. Analysis by L. G. Eakins.

C. Saussurite from gabbro, Sacramento River road, 37 miles north of Pit River ferry, Shasta County, Cal. Specific gravity, 3.148. Analysis by F. W. Clarke. See Bulletin 9.

D. Saussurite from the Saas Valley, Switzerland. Pale greenish. Specific gravity, 3.37. Analysis by F. W. Clarke; iron determination by R. B. Riggs.

	A.	B.	C.	D.
SiO_2	45.12	38.98	42.79	48.29
Al_2O_3	30.53	31.02	29.43	27.65
Fe_2O_3	.....	4.15	.....	.....
FeO	1.90	.....	3.65	1.45
MnO	.....	.23	.....	.....
MgO	.42	.....	1.40	5.36
CaO	17.34	23.80	18.13	12.95
Na_2O	2.02	.....	2.51	3.57
K_2O	1.09	.....	.....	trace
H_2O	.74	2.03	2.42	.54
	99.16	100.21	100.33	99.81

EPIDOTE.

A. Dark gray, brilliant crystals from Phippsburg, Me. Analyzed by W. F. Hillebrand and described in Bulletin 167.

B, C. Epidote from Italian Mountain, Gunnison County, Colo. Specific gravities: B, 3.448 at 25°; C, 3.452 at 17°. Analyses by L. G. Eakins.

	A.	B.	C.
SiO_2	38.54	38.21	37.22
Al_2O_3	28.39	28.70	24.09
Fe_2O_3	6.89	8.16	12.80
FeO	.50	----	.79
MnO	----	----	.11
MgO	trace	----	trace
CaO	24.12	24.30	23.36
Na_2O	----	.21	.06
H_2O	2.26	.10	1.61
F	none	.35	.06
	100.70	100.03	100.10
O equivalent to F	----	.15	.02
	----	99.88	100.08

PIEDMONTITE.

From the rhyolite of Pine Mountain, near Monterey Station, Maryland. Contains a little admixed quartz. Analysis by W. F. Hillebrand.

SiO_2	47.37
Al_2O_3	18.55
Ce_2O_3	.75
Other rare earths, mol. wt. at 295	1.28
Fe_2O_3	4.02
Mn_2O_3	6.85
MnO	1.92
PbO	.14
CuO	.11
CaO	15.82
MgO	.25
K_2O	.68
Na_2O	.23
Li_2O	trace
H_2O at 100°	.14
H_2O above 100°	1.94
P_2O_5	trace
	100.05

ALLANITE.

From Platte Mountain, Douglas County, Colo. Specific gravity, 3.52 at 29°. Analysis by L. G. Eakins. See Proc. Colorado Sci. Soc., vol. 2, p. 32.

SiO_2	31.13
Al_2O_3	11.44
Fe_2O_3	6.24
Ce_2O_3	12.50
$(LaDi)_2O_3$	10.98
FeO	13.59
BaO	.27?
MnO	.61
CaO	9.44
MgO	.16
K_2O	trace
Na_2O	.56
H_2O	2.78
CO_2	.21
P_2O_5	trace
	99.91

PREHNITE.

A. From Paterson, N. J. Analysis by George Steiger.
B. From Fassa, Tyrol. Analysis by E. A. Schneider.

	A.	B.
SiO_2	42.31	43.32
Al_2O_3	19.95	25.50
Fe_2O_3	6.20	trace
FeO	none	----------
CaO	26.63	26.49
MgO	none	----------
H_2O at 100°	.21	.17
H_2O at 250°–300°	4.81	.14
H_2O by ignition		4.70
	100.11	100.32

TOPAZ.

A. White, opaque topaz from Stoneham, Me. Specific gravity, 3.51.

B. Alteration product of A, greenish. Specific gravity, 3.42. Analyses A and B by J. E. Whitfield. See discussion by Clarke in Bulletin 27.

C. Topaz from Florissant, Colo. Specific gravity, 3.578 at 22°. Analyzed by W. F. Hillebrand, and described in Bulletin 20.

	A.	B.	C.
SiO_2	31.92	35.15	33.15
Al_2O_3	57.38	53.18	57.01
CaO	----------	1.32	----------
MgO	----------	.17	----------
K_2O	.15	1.52	----------
Na_2O	1.33	1.28	----------
H_2O	.20	.90	----------
F	16.99	12.88	16.04
	107.97	106.40	106.20
O equivalent to F	7.16	5.42	6.75
	100.81	100.98	99.45

The final alteration of the Stoneham topaz is into muscovite, q. v. The alteration product here given represents the beginning of the process.

SILLIMANITE.

Fibrolite adze from Brittany. Specific gravity, 3.147, determined by William Hallock. Analysis by F. W. Clarke. See Bulletin 60.

SiO_2	34.66
Al_2O_3	63.24
Fe_2O_3	trace
MgO	.37
Ignition	1.31
	99.58

KYANITE.

Pale green variety, associated with the dumortierite of Clip, Ariz. Analyzed by W. F. Hillebrand. Titanic oxide is present in appreciable amounts, but was not separated from alumina. The mineral contained a few black, nonmagnetic grains, which may have carried the titanium. Specific gravity, 3.656 at 18.5°.

SiO_2	36.30
$Al_2O_3(TiO_2)$	62.51
Fe_2O_3	.70
FeO	undet.
CuO	trace
Ignition	.40
	99.91

ILVAITE.

From Golconda mine, South Mountain, Owyhee County, Idaho. Analysis by W. F. Hillebrand. Specific gravity, 4.059 at 31°.

SiO_2	29.16
Al_2O_3	.52
Fe_2O_3	20.40
FeO	29.14
MnO	5.15
CaO	13.02
MgO	.15
Na_2O	.08
H_2O at 105°	.15
H_2O above 105°	2.64
	100.41

CALAMINE.

White, highly crystalline. From Sterling, N. J. Analysis by George Steiger.

SiO_2	24.15
Al_2O_3, Fe_2O_3	.19
ZnO	67.55
CaO	.12
H_2O at 100°	.27
H_2O above 100°	7.68
	99.96

LAWSONITE.

From Tiburon Peninsula, California. Collected by F. L. Ransome. Analysis by W. F. Hillebrand.

SiO_2	38.45
TiO_2	.38
Al_2O_3	31.35
Fe_2O_3	.86
FeO	.10
MnO	trace
CaO	17.52
MgO	.17
K_2O	.23
Na_2O	.06
Ignition	11.21
	100.33

STAUROLITE.

Altered staurolite from Liberty Grove, Cecil County, Md. About two-thirds muscovite. Analysis by George Steiger.

SiO_2	50.17
TiO_2	.55
Al_2O_3	27.97
Fe_2O_3	6.13
FeO	1.18
MgO	1.15
K_2O	7.77
Na_2O	.48
H_2O at 100°	.42
H_2O above 100°	3.94
P_2O_5	.06
	99.82

GADOLINITE.

Analyses by L. G. Eakins.

A. From Llano County, Tex. Specific gravity, 4.239 at 17.4°.

B, C. From Devils Head Mountain, Douglas County, Colo. Specific gravities: B, 4.56 at 17°; C, 4.59 at 25.5°. Described in Proc. Colorado Sci. Soc., vol. 2, pt. 1, p. 32.

	A.	B.	C.
SiO_2	23.79	22.13	21.86
ThO_2	.58	.89	.81
Al_2O_3	----------	2.34	.54
Fe_2O_3	.96	1.13	3.59
Ce_2O_3	2.62	11.10	6.87
$(La\ Di)_2O_3$	5.22	21.23	19.10
Y_2O_3	[a]41.55	[b]9.50	[b]12.63
Er_2O_3		[b]12.74	[b]15.80
FeO	12.42	10.43	11.36
MnO	trace	----------	.11
GlO	11.33	7.19	5.46
CaO	.74	.34	.47
MgO	trace	.14	.16
K_2O	trace	.18	.20
Na_2O	trace	.28	.32
H_2O	1.03	.86	.74
P_2O_5	.05	----------	----------
	100.29	100.48	100.03

[a] Molecular weight, 260.

[b] Molecular weight Y, Er group: in B, 296; in C, 294.

YTTRIALITE.

From the Barringer mine, Llano County, Tex. Analyzed by W. F. Hillebrand, and discussed in Amer. Jour. Sci., 4th ser., vol. 13, p. 145.

SiO_2	29.63
TiO_2	.05
ThO_2	10.85
UO_2	1.64
Ce_2O_3	3.07
La_2O_3 group, mol. wt., 335.6	5.18
Y_2O_3 group, mol. wt., 265.8	43.45
Fe_2O_3	.76
FeO	1.96
MnO	.88
PbO	.80
CaO	.67
MgO	.16
H_2O at 105°	.32
H_2O above 105°	.04
CO_2	.11
P_2O_5	.12
A, He, F, and alkalies by difference	.31
	100.00

ROWLANDITE.

From Llano County, Tex. Analysis by W. F. Hillebrand, with discussion in Bulletin 113. Specific gravity, 4.513 at 15.5°.

SiO_2	26.04
X[a]	.39
ThO_2	.59
Ce_2O_3	5.06
La_2O_3 group, mol. wt., 336.8	9.34
Yt_2O_3 group, mol. wt., 266.2	47.70
Fe_2O_3	.09
FeO	4.39
MnO	.67
CaO	.59
MgO	1.62
Alkalies	.28
H_2O	.24
CO_2	.34
F	3.87
P_2O_5	trace
	101.12
O equivalent to F	1.63
	99.49

MACKINTOSHITE.

From Llano County, Tex. Analyzed by W. F. Hillebrand and discussed in Bulletin 113. Specific gravity, 5.43 at 21.4°. Only nine-tenths of a gram available for analysis.

[a] A mixture of indefinable earths with some uranium and a trace of titanium.

SiO_2	13.90
UO_2	22.40
ZrO_2 ?	.88
ThO_2, Ce_2O_3	45.30
La_2O_3 group, Yt_2O_3 group	1.86
PbO	3.74
FeO	1.15
CaO	.59
MgO	.10
K_2O	.42
$(NaLi)_2O$	.68
P_2O_5	.67
H_2O at 100°	.50
H_2O above 100°	4.31
	96.50

CYRTOLITE.

A doubtful mineral from Devils Head Mountain, Douglas County, Colo. Analyses by W. F. Hillebrand, with description in Proc. Colorado Sci. Soc., vol. 3, pt. 1, p. 44. Brown crystalline growths of irregular form. Specific gravities: A, 3.70; B, 3.60; C, 3.64. The material may be a mixture of cyrtolite or some analogous alteration of zircon with limonite and a phosphate.

	A.	B.	C.
SiO_2	20.06	20.64	19.21
Ta_2O_5	47.99	.71	51.00
SnO_2		.03	
ZrO_2		47.81	
ThO_2	1.16	1.20	.60
Ce_2O_3	.06		
$(LaDi)_2O_3$	.19		
Er_2O_3	4.77	4.76	4.55
Y_2O_3	2.27	2.48	3.18
Fe_2O_3	5.53	5.97	4.86
MnO	.47	.57	.33
CaO	1.99	1.93	2.15
MgO	.13	.11	----------
K_2O	.20	.10	.17
Na_2O	.46	.50	.42
H_2O	12.87	12.00	12.97
P_2O_5	1.64	1.75	.93
F	.25	.42	.42
	100.04	100.98	100.74

DANBURITE.

From Russell, N. Y. Analysis by J. E. Whitfield. See Bulletin 55.

SiO_2	49.70
B_2O_3	25.80
CaO	23.26
Fe_2O_3, Al_2O_3	1.02
Ignition	.20
	99.98

DATOLITE.

From Bergen Hill, N. J. Analysis by J. E. Whitfield. See Bulletin 55.

SiO_2	35.74
B_2O_3	22.60
CaO	35.14
FeO	.31
H_2O	6.14
	99.93

AXINITE.

Analyses by J. E. Whitfield, with discussion in Bulletin 55.

A. Clove brown, from Cornwall, England. Translucent.

B. Pearl gray, from Bourg d'Oisans, Dauphiny. Transparent.

	A.	B.
SiO_2	42.10	41.53
Al_2O_3	17.40	17.90
Fe_2O_3	3.06	3.90
FeO	5.84	4.02
CaO	20.53	21.66
MnO	4.63	3.79
MgO	.66	.74
B_2O_3	4.64	4.62
H_2O	1.80	2.16
	100.66	100.32

DUMORTIERITE.

A. Harlem, N. Y. Analysis by R. B. Riggs. See Am. Jour. Sci., 3d ser., vol. 34, p. 406.

B. Harlem, N. Y. Analysis by J. E. Whitfield.

C. Near Clip, Yuma County, Ariz. Analysis by J. E. Whitfield.

D. Purified sample from Clip. Analysis by Whitfield. Specific gravity a little over 3.265.

See note by Whitfield in Bulletin 60, and paper by Diller and Whitfield in Bulletin 64.

	A.[a]	B.	C.	D.
SiO_2	34.82	31.44	31.52	27.99
Al_2O_3	55.30	68.91	63.66	64.49
Fe_2O_3	trace			
CaO	trace		trace	
MgO	.57		.52	trace
Na_2O	1.76		.37	
K_2O	1.04		.11	
Li_2O	trace			
B_2O_3	4.07	trace	2.62	4.95
P_2O_5				.20
Ignition	2.96		1.34	1.72
	100.52	100.35	100.14	99.35

[a] Sample A contaminated by tourmaline.

TOURMALINE.

Analyses A to V, inclusive, by R. B. Riggs. Discussed by Riggs in Bulletin 55.

A. Pink center of crystals having a green margin, from Calhao, province of Minas-Geraes, Brazil. Specific gravity, 3.028.

B. Pale green, border of A.

C. Olive-green, also from Calhao, Brazil.

D. Rose-colored, massive, from Black Mountain, Rumford, Me. Specific gravity, 2.997.

E. Dark green, massive, same locality as D.

	A.	B.	C.	D.	E.
SiO_2	37.19	37.39	36.91	38.07	36.53
Al_2O_3	42.43	39.65	38.13	42.24	38.10
Fe_2O_3	none	.15	.31	.....	none
FeO	.52	2.29	3.19	.26	6.43
MnO	.79	1.47	2.22	.35	.32
MgO	none	none	.04	.07	none
CaO	.57	.49	.38	.56	.34
Li_2O	1.73	1.71	1.61	1.59	.95
Na_2O	2.24	2.42	2.70	2.18	2.86
K_2O	.23	.25	.28	.44	.38
P_2O_5	none	trace	.11	none	trace
B_2O_3	10.06	10.29	9.87	9.99	10.22
H_2O	3.90	3.63	3.64	4.26	3.52
F	trace?	.32	.14	.28	.16
	99.66	100.06	99.53	100.29	99.81
O equivalent to F	.....	.13	.06	.12	.07
	.....	99.93	99.47	100.17	99.74

F. Alteration product of the Rumford tourmaline.

G. Alteration product of rubellite, from Hebron, Me.

H. Colorless to very pale pinkish or greenish crystals, Auburn, Me. Specific gravity, 3.07.

I. Light-green crystals, Auburn, Me.

J. Dark green, massive tourmaline, Auburn, Me.

	F.	G.	H.	I.	J.
SiO_2	53.03	43.90	38.14	37.85	36.26
Al_2O_3	31.67	38.71	39.60	37.73	36.68
Fe_2O_3	.51	.58	.30	.42	.15
FeO	------	.25	1.38	3.88	7.07
MnO	trace	.04	1.38	.51	.72
MgO	trace	.05	trace	.04	.16
CaO	trace	.41	.43	.49	.17
Li_2O	.26	------	1.34	1.34	1.05
Na_2O	.54	1.05	2.36	2.16	2.88
K_2O	9.44	10.92	.27	.62	.44
B_2O_3	trace	trace	10.25	10.55	9.94
P_2O_5	------	------	trace	trace	trace
H_2O	4.80	4.25	4.16	4.18	4.05
F	trace?	none	.62	.62	.71
	100.25	100.16	100.23	100.39	100.28
O equivalent to F	------	------	.26	.26	.30
	------	------	99.97	100.13	99.98

K. White to light-brown crystals, Dekalb, St. Lawrence County, N. Y. Specific gravity, 3.085.

L. Brown tourmaline, Gouverneur, St. Lawrence County, N. Y.

M. Cinnamon-brown crystals, Hamburg, N. J.

N. Brilliant black crystals, Pierrepont, St. Lawrence County, N. Y. Specific gravity, 3.08.

O. Dark-brown crystals, Orford, N. H.

P. Dark-brown crystals, Monroe, Conn.

	K.	L.	M.	N.	O.	P.
SiO_2	36.88	37.39	35.25	35.61	36.66	36.41
TiO_2	.12	1.19	.65	.55	.23	1.61
Al_2O_3	28.87	27.79	28.49	25.29	32.84	31.27
Fe_2O_3	.....	.10	none	.44	none	none
FeO	.52	.64	.86	8.19	2.50	3.80
MnO	none	none	none	trace	trace	trace
MgO	14.53	14.09	14.58	11.07	10.35	9.47
CaO	3.70	2.78	5.09	3.31	1.35	.98
SrO	trace	trace	trace	none	trace	trace
Li_2O	trace	trace	trace	trace	trace	none
Na_2O	1.39	1.72	.94	1.51	2.42	2.68
K_2O	.18	.16	.18	.20	.22	.21
B_2O_3	10.58	10.73	10.45	10.15	10.07	9.65
P_2O_5	undet.	none	trace	trace	none	trace
H_2O	3.56	3.83	3.10	3.34	3.78	3.79
F	.50	trace?	.78	.27	trace?	none
	100.83	100.42	100.37	99.93	100.42	99.87
O equivalent to F	.21	.....	.33	.11	.....	.....
	100.62	.....	100.04	99.82	.....	.....

Q. Massive, black tourmaline, Auburn, Me. Specific gravity, 3.19.
R. Massive, black tourmaline, Paris, Me.
S. Black tourmaline, Calhao, Brazil. Specific gravity, 3.20.
T. Black tourmaline, Haddam, Conn.

	Q.	R.	S.	T.
SiO_2	34.99	35.03	34.63	34.95
TiO_2	none	----	----	.57
Al_2O_3	33.96	34.44	32.70	31.11
Fe_2O_3	none	1.13	.31	.50
FeO	14.23	12.10	13.69	11.87
MnO	.06	.08	.12	.09
MgO	1.01	1.81	2.13	4.45
CaO	.15	.24	.33	.81
Li_2O	trace	.07	.08	trace
Na_2O	2.01	2.03	2.11	2.22
K_2O	.34	.25	.24	.24
B_2O_3	9.63	9.02	9.63	9.92
P_2O_5	trace	trace	none	trace
H_2O	3.62	3.69	3.49	3.62
F	none	none	.06	none
	100.00	99.89	99.52	100.35
O equivalent to F	----	----	.02	----
	----	----	99.50	----

U. Black crystal, Nantic Gulf, Baffin Land. Specific gravity, 3.095.

V. Black crystal, Stony Point, Alexander County, N. C. Specific gravity, 3.13.

W. Brown tourmaline from near Colfax, Nevada County, Cal. Fine, radiating needles. Specific gravity, 3.065. Incomplete analysis by W. H. Melville. See Bulletin 90.

X. Chrome tourmaline from near Etchison, Montgomery County, Md. Analysis by T. M. Chatard. See Bulletin 64.

	U.	V.	W.	X.
SiO_2	35.34	35.56	36.40	36.57
TiO_2	.40	.55	.....	.09
Al_2O_3	30.49	33.38	33.64	32.58
Cr_2O_3	.....	.....	.....	4.32
Fe_2O_3	none	none	3.13	.79
FeO	8.22	8.49		
MnO	trace	.04	.....	trace
NiO	.....	.....	.....	.05
MgO	7.76	5.44	10.01	9.47
CaO	2.32	.53	1.51	.75
SrO	trace	none	.....	.....
Li_2O	trace	trace	.....	trace
Na_2O	1.76	2.16	2.49	2.22
K_2O	.15	.24	.12	.13
B_2O_3	10.45	10.40	[a]8.74	8.90
P_2O_5	none	(?)	.....	.04
H_2O	3.60	3.63	3.53	3.74
F	none	none	.74	.06
	100.49	100.42	100.31	99.71
O equivalent to F	.....	.....	.31	.02
	.....	.....	100.00	99.69

[a] By difference.

GYROLITE.

Associated with the apophyllite of New Almaden, Cal. Fibrous. Analyzed by F. W. Clarke and described in Bulletin 64.

SiO_2	52.54
Al_2O_3, Fe_2O_3	.71
CaO	29.97
K_2O	1.56
Na_2O	.27
F	.65
Ignition	14.60
	100.30
O equivalent to F	.27
	100.03

APOPHYLLITE.

From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

A. Apophyllite.

B. Decomposition product of apophyllite.

	A.	B.
SiO_2	51.89	67.96
Al_2O_3	1.54	8.48
Fe_2O_3	.13	1.04
CaO	24.51	5.47
MgO	----------	.53
K_2O	3.81	1.23
Na_2O	.59	*a* .74
H_2O	16.52	14.55
F	1.70	none
	100.69	100.00
O equivalent to F	.72	----------
	99.97	----------

a By difference.

PTILOLITE.

Described as a new species by Cross and Eakins in Am. Jour. Sci., 3d ser., vol. 32, p. 117, and vol. 44, p. 96. Analyses by L. G. Eakins.

A. From Green Mountain, Jefferson County, Colo.

B. From 3 miles south of Silver Cliff, Custer County, Colo.

	A.	B.
SiO_2	70.35	67.83
Al_2O_3	11.90	11.44
CaO	3.87	3.30
K_2O	2.83	.64
Na_2O	.77	2.63
H_2O at 110°	10.18	3.62
H_2O at 125°		1.31
H_2O at 300°		5.41
H_2O at redness		3.10
	99.90	99.28

HEULANDITE.

A. From Green Mountain, Jefferson County, Colo. Analysis by L. G. Eakins.

B. From Anthracite Creek, Gunnison County, Colo. Analysis by L. G. Eakins. Specific gravity, 2.24 at 20.1°.

C. From Berufiörd, Iceland. Analysis by George Steiger.

	A.	B.	C.
SiO_2	59.17	57.38	57.10
Al_2O_3	16.80	17.18	16.82
Fe_2O_3	----------	trace	----------
MgO	----------	----------	.07
CaO	7.10	8.07	6.95
SrO	----------	----------	.46
Na_2O	1.37	.82	1.25
K_2O	.34	.40	.42
H_2O at 110°	15.45	2.57	3.61
H_2O at 125°		1.10	
H_2O at 300°		11.70	13.00
H_2O at redness		.90	
	100.23	100.12	99.68

STILBITE.

A. From Wassons Bluff, near Parrsboro, Nova Scotia. Analysis by George Steiger.

B. From Italian Mountain, Gunnison County, Colo. Analysis by L. G. Eakins.

C. From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

	A.	B.	C.
SiO_2	55.41	57.75	54.67
Al_2O_3	16.85	16.64	16.78
Fe_2O_3	.18	----------	----------
MgO	.05	----------	----------
CaO	7.78	8.58	7.98
Na_2O	1.23	trace	1.47
H_2O at 100°	3.60	17.17	19.16
H_2O above 100°	15.41		
	100.51	100.14	100.06

LAUMONTITE.

From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

A. Yellow grains.

B. White crystals.

	A.	B.
SiO_2	51.45	52.07
Al_2O_3	21.52	21.30
Fe_2O_3	.94	----------
CaO	11.88	11.24
K_2O	.35	.42
Na_2O	.19	.48
H_2O	13.81	14.58
	100.12	100.09

CHABAZITE.

A. From Wassons Bluff, near Parrsboro, Nova Scotia. Analysis by George Steiger.

B, C. From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

	A.	B.	C.
SiO_2	50.78	47.86	47.18
Al_2O_3	17.18	19.30	19.67
Fe_2O_3	.40	.12	.....
MgO	.04	.....	.....
CaO	7.84	9.94	9.74
SrO	.....		.43
Na_2O	1.28	.52	.51
K_2O	.73	.35	.37
H_2O at 100°	5.22	22.07	4.76
H_2O above 100°	16.63		17.39
	100.10	100.16	100.05

LEVYNITE.

From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

A. Crystals of levynite.

B. Associated fibrous variety.

	A.	B.
SiO_2	46.76	46.97
Al_2O_3	21.91	22.39
CaO	11.12	10.85
K_2O	.21	1.17
Na_2O	1.34	.79
H_2O	18.65	18.03
	99.99	100.20

ANALCITE.

A. From Wassons Bluff, near Parrsboro, Nova Scotia. Analysis by George Steiger. See Bulletin 207.

B. From Table Mountain, Golden, Colo. Analysis by George Steiger. See Bulletin 207.

C, D. From Table Mountain. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

	A.	B.	C.	D.
SiO_2	57.06	55.72	55.82	55.80
Al_2O_3	21.48	23.06	22.42	22.45
Fe_2O_3	.13			
CaO	.16	.17		
Na_2O	12.20	12.46	13.48	13.45
H_2O at 100°	.58	.13	8.38	8.35
H_2O above 100°	8.38	8.26		
	99.99	99.80	100.10	100.05

NATROLITE.

A. From Bergen Hill, New Jersey. Analysis by George Steiger. See Bulletin 207.

B. From Magnet Cove, Arkansas. Analysis by W. H. Melville. Described in Bulletin 90. Specific gravity, 2.261.

C. From South Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

	A.	B.	C.
SiO_2	46.62	47.56	43.66
Al_2O_3	26.04	26.82	24.89
Fe_2O_3	none	.23	
CaO	1.48	.13	4.87
MgO	none	.09	
Na_2O	15.67	15.40	14.66
H_2O at 100°	.39	.07	[a]8.09
H_2O above 100°	10.18	9.56	
CO_2			[b]3.83
	100.38	99.86	100.00

[a] By difference. Too little material for complete analysis.
[b] Calculated to satisfy total line.

SCOLECITE.

A. From Whale Cove, Grand Manan, New Brunswick. Analysis by George Steiger. See Bulletin 207.

B. From Italian Mountain, Gunnison County, Colo. Analysis by L. G. Eakins. Specific gravity, 2.247 at 17.2°.

C. From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

	A.	B.	C.
SiO_2	45.86	45.90	46.03
Al_2O_3	25.78	26.51	25.28
Fe_2O_3			.27
CaO	13.92	14.17	12.77
MgO		trace	
Na_2O	.41	trace	1.04
K_2O			.13
H_2O at 100°	.40		[a]14.48
H_2O above 100°	13.65	13.79	
	100.02	100.37	100.00

[a] By difference.

MESOLITE.

From North Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

SiO_2	46.17
Al_2O_3	26.88
CaO	8.77
Na_2O	6.19
H_2O	12.16
	100.17

THOMSONITE.

From Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses A, B, C, D, E by W. F. Hillebrand. Analysis F by George Steiger; published in Bulletin 207. A represents reddish spherules; F, a mass of fibrous structure.

	A.	B.	C.	D.	E.	F.
SiO_2	40.52	40.88	40.68	41.21	42.66	41.13
Al_2O_3	29.22	29.68	30.12	29.71	29.25	29.58
Fe_2O_3	.79					
CaO	12.43	11.88	11.92	11.34	10.90	11.25
Na_2O	4.31	4.72	4.44	5.62	4.92	5.31
H_2O at 100°	} 12.79	} 12.91	} 12.86	} 12.20	} 12.28	1.01
H_2O above 100°						12.12
	100.06	100.07	100.02	100.08	100.01	100.40

HYDRONEPHELITE.

From the elæolite-syenite of Litchfield, Me. Described by Clarke as a new species in Bulletin 42. Analyses by F. W. Clarke. Specific gravity, 2.263, determined by J. S. Diller.

A, B. Slightly impure. Two distinct samples.

C. Carefully purified material dried at 100°.

	A.	B.	C.
SiO_2	38.90	39.24	38.99
Al_2O_3	33.98	33.16	33.62
Fe_2O_3	trace	trace	
CaO	.05	trace	.07
Na_2O	13.21	13.07	13.07
K_2O	1.01	.88	1.12
H_2O	13.12	13.30	12.98
	100.27	99.65	99.85

MUSCOVITE.

A. From the Hatch farm, Auburn, Me. Broad plates, bordered by lepidolite. Analysis by R. B. Riggs.

B. Greenish muscovite, Auburn, Me. Analysis by E. A. Schneider.

C. Altered muscovite, Mount Mica, Paris, Me. Occurs as a white enamel on ordinary mica. Analysis by F. W. Clarke.

D. Well-crystallized muscovite from the hiddenite mine, Stony Point, Alexander County, N. C. Analysis by F. W. Clarke.

E. White muscovite from Miask, Ural Mountains, Siberia. Analysis by E. A. Schneider.

F. Mica separated from quartz-schist. Shoemaker's quarry, near Stevenson Station, Green Spring Valley, Maryland. Analysis by E. A. Schneider.

G. Mica from the Eureka tunnel, St. Peters Dome, near Pikes Peak, Colorado. Analysis by W. F. Hillebrand. See Bulletin 20.

	A.	B.	C.	D.	E.	F.	G.
SiO_2	44.39	46.54	46.61	45.40	44.17	44.93	52.59
TiO_2	.....	none	.....	1.10	.....	1.05	.....
Al_2O_3	35.70	34.96	35.61	33.66	37.35	29.81	29.72
Fe_2O_3	1.09	1.59		2.36	1.29	6.10	1.40
FeO	1.07	.....	.....	.....	.20		
MnO	trace	.....	trace	.....	.10	trace	.....
MgO	.....	.32	.....	1.86	.....	1.16	2.12
CaO	.10	.....	trace	.....	.....	.....	.26
Li_2O	.....	.....	.....	trace	.....	trace	.....
Na_2O	2.41	.41	1.76	1.41	1.14	.50	.50
K_2O	9.77	10.38	8.86	8.33	10.00	10.28	8.33
H_2O at 100°	5.88	.71	6.50	5.46	1.06	1.38	4.39
H_2O above 100°		4.72			4.67	4.88	
F	.72	none	.....	.69	.90	.22	.....
	101.13	99.63	99.34	100.27	100.88	100.31	99.31
O equivalent to F	.30	.....	.....	.29	.37	.09	.....
	100.83	.....	.....	99.98	100.51	100.22	.....

H. Fuchsite. Etchison post-office, Montgomery County, Md. Analysis by T. M. Chatard. See Bulletin 64.

I. Grayish-green, compact mica from Stoneham, Me. Structure subfibrous. Analysis by T. M. Chatard.

J. Same locality as I. Specimen broadly foliated, micaceous. Analysis by T. M. Chatard. For analyses I and J see Bulletin 9.

K. Stoneham, Me. From alteration of topaz, the outer portion of an altered crystal. Specific gravity, 2.82. Analysis by J. E. Whitfield. Discussed by Clarke in Bulletin 27.

L. Pseudomorph from the Rochelle mine, on Running Water River, Wyoming. Near liebenerite. Specific gravity, 2.831 at 12.5°. Analyzed by W. F. Hillebrand and described in Bulletin 20.

M. Mariposite. From vein of the Josephine gold quartz mine, Bear Valley, Mariposa County, Cal. Color, green. Specific gravity, 2.817 at 29.5°.

N. White mariposite, same locality as M. Specific gravity, 2.787 at 28.5°. Analyses M and N by W. F. Hillebrand, and described in Bulletin 167.

	H.	I.	J.	K.	L.	M.	N.
SiO_2	42.21	45.19	45.34	44.52	45.54	55.35	56.79
TiO_2						.18	
Al_2O_3	34.55	33.32	33.96	46.19	37.15	25.62	25.29
Cr_2O_3	2.03				.79	.18	none
Fe_2O_3	1.03					.63	1.59
FeO		4.25	3.96			.92	
MnO	trace	.58	.51	.21			
CaO	.47	trace	.22	.30		.07	.07
MgO	3.13	.36	.10	.14	.38	3.25	3.29
Li_2O						trace	trace
Na_2O	.82	1.57	1.49	2.82	.90	.12	.17
K_2O	9.16	11.06	10.73	2.30	10.70	9.29	8.92
H_2O at 110°	.20	4.48	4.78	3.74	4.80	4.52	4.72
H_2O above 110°	6.57						
F				.40			
	100.17	100.81	101.09	100.62	100.26	100.13	100.84
O equivalent to F				.16			
				100.46			

LEPIDOLITE.

From various localities in Maine. Analyses by R. B. Riggs. Discussion by F. W. Clarke in Bulletin 42.

A. From Black Mountain, Rumford. Lilac-purple, granular.
B. From Mount Mica, Paris. Broadly foliated.
C. From Hebron. Purple, coarsely granular.
D. From Auburn. Purple border on plates of muscovite.
E. From Auburn. Purple, coarsely granular.
F. From Norway. White, coarsely granular.
G. From Norway. Brownish, finely granular.

	A.	B.	C.	D.	E.	F.	G.
SiO_2	51.52	50.92	48.80	49.62	51.11	49.52	50.17
Al_2O_3	25.96	24.99	28.30	27.30	25.26	28.80	25.40
Fe_2O_3	.31	.30	.29	.31	.20	.40	.87
FeO	undet.	.23	.09	.07	.07	.24	.45
MnO	.20	trace	.08	.55	.17	.07	.23
CaO	.16	trace	.10	----	.12	.13	undet.
MgO	.02	trace	.07	----	.01	.02	undet.
Li_2O	4.90	4.20	4.49	4.34	4.98	3.87	4.03
Na_2O	1.06	2.11	.74	2.17	1.43	.13	
K_2O	11.01	11.38	12.21	8.03	10.51	8.82	13.40
Rb_2O	----	trace		2.44	1.29	3.73	
Cs_2O	----	trace		.72	.45	.08	
H_2O	.95	1.96	1.73	1.52	.94	1.72	2.02
F	5.80	6.29	4.96	5.45	6.57	5.18	5.05
	101.89	102.38	101.86	102.52	103.11	102.71	101.62
O equivalent to F	2.44	2.64	2.02	2.29	2.76	2.18	2.13
	99.45	99.74	99.84	100.23	100.35	100.53	99.49

CRYOPHYLLITE.

From Rockport, Mass. Analyses by R. B. Riggs. Discussed by Clarke in Bulletin 42.

A. Brilliant, broadly foliated, blackish-green variety.

B. Paler, dull green, less lustrous, probably somewhat altered.

C. Granular, resembling chlorite.

	A.	B.	C.
SiO_2	51.96	51.46	52.17
Al_2O_3	16.89	16.22	16.39
Fe_2O_3	2.63	2.21	4.11
FeO	6.35	7.66	6.08
MnO	.24	.06	.32
CaO	.12	trace	trace
MgO	.03	.17	trace
Li_2O	4.93	4.83	5.03
Na_2O	.92	.95	.60
K_2O	10.66	10.65	10.54
H_2O	1.22	1.06	1.43
F	6.78	7.44	7.02
	102.73	102.71	103.69
O equivalent to F	2.86	3.11	2.95
	99.87	99.60	100.74

BIOTITE.

A. From Merrow Ledge, Auburn, Me. Black. Analysis by F. W. Clarke and R. B. Riggs.

B. Bronze-mica, Laurel Creek corundum mine, Rabun County, Ga. Analysis by E. A. Schneider. The loss is due to undetermined volatile matter.

C. Brown mica from the granite of the Yosemite Valley, California. Analysis by William Valentine. Described by Turner, Am. Jour. Sci., 4th ser., vol. 7, p. 294.

D. Mica from quartz-monzonite, Tioga road, southeast of Mount Hoffman, Mariposa County, Cal. Specific gravity, 3.05 at 21°. Analysis by W. F. Hillebrand. Described by Turner, loc. cit.

E. Black mica from quartz-monzonite. About 1 kilometer south of Bloods Station, Alpine County, Cal. Analysis by William Valentine. Described by Turner, loc. cit.

F. Reddish-brown mica from pyroxenic gneiss. North fork of Mokelumne River, above mouth of Bear River, Amador County, Cal. Analysis by William Valentine. Described by Turner, loc. cit.

G. Biotite from the granite of Butte, Mont. See Weed, Jour. Geol., vol. 7, p. 737. Analysis by H. N. Stokes.

	A.	B.	C.	D.	E.	F.	G.
SiO_2	34.67	36.12	35.64	35.75	35.62	36.62	35.79
TiO_2	.....	1.18	1.12	3.16	2.61	3.03	3.51
Al_2O_3	30.09	20.49	18.62	14.70	15.24	14.37	13.70
V_2O_3	.....	.....	.....	.05	.....	.....	.....
Cr_2O_3	.....	.....	.....	trace	.....	.....	.....
Fe_2O_3	2.42	3.29	5.54	4.65	4.69	4.04	5.22
FeO	16.14	5.17	14.60	14.08	13.67	17.09	13.72
MnO	.85	.17	.79	.45	.74	.40	.19
NiO	.....	.34	.....	.02	.....	.....	.....
CoO	.....	.....	.....		.....	.....	.....
CaO	none	.28	.90	.17	.95	1.48	.05
SrO	.....	.....	.....	(?)	trace	trace	.....
BaO	.....	.09	trace	.12	.26	.33	.13
MgO	1.98	19.61	9.72	12.37	12.70	9.68	12.13
Li_2O	.....	trace	trace	.....	trace	trace	trace
Na_2O	1.67	.78	.38	.32	.50	.45	.15
K_2O	7.55	8.14	9.22	9.19	7.72	8.20	9.09
H_2O at 105°	4.64	1.58	.48	1.03	.94	.90	1.21
H_2O above 105°		.82	2.54	3.64	4.36	3.26	3.64
P_2O_5	.....	.....	.20	.03	none	none	.10
F	.28	.60	.26	.17	none	.10	.76
Cl	.....	.....	.....	.....	.....	.....	.20
	100.29	98.66	100.01	99.90	100.00	99.95	99.59
Less O	.12	.26	.11	.07	.....	.04	.37
	100.17	98.40	99.90	99.83	.....	99.91	99.22

PHLOGOPITE.

A. From Edwards, St. Lawrence County, N. Y. Outwardly resembles talc. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 78.

B. From Burgess, Canada. Brown. Analysis by E. A. Schneider. See Clarke and Schneider, Bulletin 78.

C. Phlogopite separated from the wyomingite of the Leucite Hills, Wyoming. Described by Cross in Am. Jour. Sci., 4th ser., vol. 4, p. 115. Analysis by W. F. Hillebrand.

The following micas of doubtful character occur in serpentine. Analyses by Charles Catlett. See Bulletin 64.

D. Brown mica, from the serpentine of Montville, N. J.

E. Yellowish mica, same locality as D.

F. White mica, same locality.

G. White mica from near Easton, Pa.

E, F, and G are perhaps to be called vermiculites rather than micas.

	A.	B.	C.	D.	E.	F.	G.
SiO_2	45.05	39.66	42.56	39.38	32.52	39.14	41.82
TiO_2		.56	2.09				
Al_2O_3	11.25	17.00	12.18	15.92	18.14	15.70	11.12
Cr_2O_3			.73				
Fe_2O_3		.27	2.73	.71	2.30	1.68	2.68
FeO	.14	.20	.90	.80			
CaO		none	.20	.28	1.44	5.24	
SrO			trace				
BaO		.62	1.00				
MgO	29.38	26.49	22.40	26.85	29.26	25.44	29.82
Li_2O	.07		trace				
Na_2O	.45	.60	.44	.62	1.38	.64	.36
K_2O	8.52	9.97	10.70	9.84	2.78	2.06	6.08
H_2O at 105°	5.37	.66		.38	.76	1.10	.94
H_2O above 105°		2.33	2.35	4.69	10.12	9.10	7.10
CO_2				.30	1.80		
P_2O_5		trace	.06				
F		2.24	2.46	.62			
	100.23	100.60	100.80	100.39	100.50	100.10	99.92
O equivalent to F		.94	1.03	.26			
		99.66	99.77	100.13			

LEPIDOMELANE.

A. From Litchfield, Me. Analyzed by F. W. Clarke, and described in Bulletin 42.

B. Same as A. Later analysis by Clarke. See Bulletin 55.

C. Annite. From Rockport, Mass. Analysis by R. B. Riggs. Discussion by Clarke in Bulletin 42.

D. From Port Henry, N. Y. Analysis by E. A. Schneider. See paper by Clarke and Schneider in Bulletin 78.

E. From Baltimore, Md. Analysis by F. W. Clarke, and discussed in Bulletin 55.

F. From near Pikes Peak, Colorado. Siderophyllite? The slightly altered margin of a large crystal.

G. Much altered central portion of specimen F. Analyses F and G by F. W. Clarke and R. B. Riggs. Described by Clarke in Bulletin 55. Classed by Dana under biotite.

	A.	B.	C.	D.	E.	F.	G.
SiO_2	32.09	32.35	32.03	34.52	35.78	34.21	34.63
TiO_2	------	trace	3.42	2.70	------	------	------
Al_2O_3	18.52	17.47	11.92	13.22	16.39	16.53	17.95
Fe_2O_3	19.49	24.22	8.09	7.80	14.55	20.15	31.25
FeO	14.10	13.11	30.41	22.27	11.02	14.17	3.01
MnO	1.42	1.02	.21	.41	1.08	.91	.34
CaO	------	none	.23	none	none	.48	.81
MgO	1.01	.89	.06	5.82	8.67	1.34	1.08
NiO,CoO	------	------	------	.30	------	------	------
Li_2O	------	------	trace	.04	------	------	------
Na_2O	1.55	.70	1.54	.16	.56	1.43	.89
K_2O	8.12	6.40	8.46	8.59	7.76	6.50	1.96
H_2O at 105°	} 4.62	} 4.67	} 4.19	.57	} 4.48	} 4.54	} 7.82
H_2O above 105°				3.82			
P_2O_5	------	------	------	trace	------	------	------
F	none	none	trace	.34	none	.08	.54
	100.92	100.83	100.47	100.56	100.29	100.34	100.28
O equivalent to F	------	------	------	.14	------	.03	.22
	------	------	------	100.42	------	100.31	100.06

ROSCOELITE.

Analyses by W. F. Hillebrand.

A. From the Stockslager mine, near Lotus, Eldorado County, Cal. Described by Hillebrand in Bulletin 167.

B. Soluble portion of a vanadiferous sandstone from Placerville, Colo. Described by Hillebrand in Am. Jour. Sci., 4th ser., vol. 10, p. 130.

	A.	B.
SiO_2	45.17	46.06
TiO_2	.78	----------
Al_2O_3	11.54	22.55
V_2O_3	24.01	12.84
Fe_2O_3	----------	.73
FeO	1.60	----------
CaO	----------	.44
BaO	----------	1.35
MgO	1.64	.92
Li_2O	trace	----------
Na_2O	trace	.22
K_2O	10.37	8.84
H_2O at 100°	.40	1.98
H_2O above 100°	4.29	4.07
	99.80	100.00

MARGARITE.

A. Brownish yellow, from Iredell County, N. C. Analysis by T. M. Chatard. See Bulletin 9.

B. Bright green, associated with pink corundum. From Gainesville, Ga. Specific gravity, 3.00. Analysis by T. M. Chatard. See Bulletin 9.

C. Inclusion in diorite, Crugers Station, near Peekskill, N. Y. Analysis by T. M. Chatard.

	A.	B.	C.
SiO_2	31.15	31.72	32.73
Al_2O_3	49.51	50.03	46.58
FeO	trace	trace	5.12
MgO	.45	.12	1.00
CaO	11.13	11.57	11.04
Na_2O	2.74	2.26	----------
H_2O at 110°	5.68	4.88	.12
H_2O above 110°			4.49
	100.66	100.58	101.08

CHLORITOID.

From a phyllite rock near Liberty, Md. Analysis by L. G. Eakins. See Bulletin 168, p. 50.

SiO_2	23.40
Al_2O_3	39.31
Fe_2O_3	5.14
FeO	21.94
MgO	2.18
CaO	trace
Na_2O	.20
K_2O	.20
H_2O	6.81
TiO_2	1.19
MnO	trace
P_2O_5	trace
	100.37

XANTHOPHYLLITE.

Variety waluewite, from the Nikolai-Maximilian mine, district of Slatoust, Urals, Siberia. Analysis by E. A. Schneider. Discussion by Clarke and Schneider in Bulletin 113.

SiO_2	16.85
TiO_2	trace
Al_2O_3	42.33
Fe_2O_3	2.35
FeO	.20
CaO	13.30
MgO	20.77
H_2O at 105°	.04
H_2O above 105°	4.56
	100.40

THE VERMICULITES.

A. Jefferisite, from Westchester, Pa. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 78.

B. Vermiculite, near jefferisite or culsageeite, from Corundum Hill, North Carolina. Analyzed by T. M. Chatard and described by him in Bulletin 42.

C. Altered biotite from the zircon mine, Green River, Henderson County, N. C. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 90.

D. Kerrite, from near Franklin, Macon County, N. C. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 78.

E. Lucasite. Described as a new species by Chatard in Bulletin 42. Analysis by T. M. Chatard. From Corundum Hill, North Carolina. Specific gravity, 2.613 at 25.5°.

	A.	B.	C.	D.	E.
SiO_2	34.20	37.96	38.18	38.13	39.81
TiO_2			1.68		
Al_2O_3	16.58	22.53	14.02	11.22	12.99
Cr_2O_3					.54
Fe_2O_3	7.41	11.12	13.02	2.28	5.29
FeO	1.13	.30	2.22	.18	.11
MnO		.12	.38		.05
NiO				.48	
CoO				trace	
CaO		none	.17		.14
BaO			.06		
MgO	20.41	15.46	14.62	27.39	24.83
Na_2O		undet.	.48		.20
K_2O		undet.	5.40		5.76
H_2O at 105°	21.14	12.63	3.20	20.47	3.78
H_2O above 105°			7.32		6.98
	100.87	100.12	100.75	100.15	100.48

F. Hallite from Nottingham, Chester County, Pa.

G. White lennilite from Lenni, Delaware County, Pa.

H. Brown lennilite, same locality.

I. Green lennilite, same locality.

Analyses F to I by E. A. Schneider. Discussion by Clarke and Schneider in Bulletin 90.

	F.	G.	H.	I.
SiO_2	35.54	36.72	35.09	34.90
TiO_2	undet.	.18	.58	.10
Al_2O_3	9.74	10.06	12.05	10.60
Fe_2O_3	9.07	5.37	6.67	8.57
Cr_2O_3	----	.26	.46	.23
FeO	.28	.12	.11	.22
MnO	.25	.31	.27	.17
NiO	.16	.20	.20	.19
MgO	30.05	29.40	27.62	28.21
BaO	----	----	trace	----
H_2O at 105°	2.64	6.40	5.70	4.99
H_2O above 105°	12.14	11.37	11.20	11.48
	99.87	100.39	99.95	99.66

J. A vermiculite from Newlin, Chester County, Pa.

K. Painterite from Middleton, Delaware County, Pa.

L. Another sample of painterite.

Analyses J, K, L by E. A. Schneider. Discussion by Clarke and Schneider in Bulletin 90.

M. Hydromica from Rocky Hill, N. J. Analysis by George Steiger. Described by Clarke and Darton in Bulletin 167.

N. Analysis M corrected by deduction of calcite, union of like radicals, and recalculation to 100 per cent.

O. Protovermiculite from Magnet Cove, Arkansas. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 90.

	J.	K.	L.	M.	N.	O.
SiO_2	31.23	34.86	33.95	32.72	40.24	34.03
TiO_2	------	trace	trace	.24	------	undet.
Al_2O_3	17.52	11.64	12.52	8.41	10.34	14.49
Cr_2O_3	.14	------	------	------	------	------
Fe_2O_3	4.70	3.78	4.40	19.99	24.57	7.71
FeO	1.20	.20	.20	4.24	5.21	.14
MnO	.20	------	------	------	------	.09
NiO	.33	.14	.23	------	------	------
CaO	------	.07	none	10.30	------	1.88
MgO	31.36	31.32	30.56	5.51	6.78	20.89
Na_2O	------	------	------	.63	------	------
K_2O	------	------	------	.85	2.20	------
H_2O at 105°	1.08	1.64	1.56	2.47	3.03	11.23
H_2O above 105°	12.55	16.78	17.05	6.22	7.63	9.96
CO_2	------	------	------	8.21	------	------
	100.31	100.43	100.47	99.79	100.00	100.42

P. Chloritic vermiculite from Corundum Hill, North Carolina.

Q. Altered chlorite from Corundum Hill. Analyses P, Q by T. M. Chatard. Description in Bulletin 42.

	P.	Q.
SiO_2	35.88	32.97
Al_2O_3	20.90	17.88
Fe_2O_3	6.55	4.76
FeO	3.68	.57
MnO	----	trace
CaO	.14	none
MgO	19.90	22.36
Alkalies	traces	undet.
H_2O at 110°	12.71	11.42
H_2O above 110°		10.05
	99.76	100.01

CLINOCHLORE.

A. From Westchester, Pa. Broadly foliated. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 78.

B. From the Nikolai-Maximilian mine, district of Slatoust, Urals, Siberia. Analysis by E. A. Schneider. Discussed by Clarke and Schneider in Bulletin 113.

C. Leuchtenbergite from Slatoust. Analyst and reference as under B.

D. Kotschubeite from Green Valley, American River Canyon, California. Specific gravity, 2.69. Analysis by W. H. Melville. Described by Melville and Lindgren in Bulletin 61.

	A.	B.	C.	D.
SiO_2	29.87	30.84	30.00	31.74
Al_2O_3	14.48	18.31	20.43	6.74
Co_2O_3	1.56	----	----	11.39
Fe_2O_3	5.52	1.94	1.68	----
FeO	1.93	1.08	.14	1.23
NiO	.17	----	----	.49
CaO	----	----	.21	.18
MgO	33.06	34.38	34.26	35.18
H_2O at 105°	13.60	.55	.55	.37
H_2O above 105°		13.33	13.20	12.68
	100.19	100.43	100.47	100.00

PROCHLORITE.

From the Aqueduct Tunnel, Washington, D. C. Analysis by E. A. Schneider. Described by Clarke and Schneider in Bulletin 78.

SiO_2	25.40
Al_2O_3	22.80
Fe_2O_3	2.86
FeO	17.77
MnO	.25
MgO	19.09
H_2O at 105°	.80
H_2O above 105°	11.41
F	trace
	100.38

SERPENTINE.

A. From Newburyport, Mass. Analysis by F. W. Clarke.

B. Same locality as A. Analysis by E. A. Schneider. Discussion by Clarke and Schneider in Bulletin 78.

C. Serpentine derived from sahlite, Osburn's soapstone quarry, Blandford, Mass. Analysis by W. F. Hillebrand.

D. Dark-green, oily serpentine, Middlefield, Mass. Analysis by W. F. Hillebrand.

E. Serpentine derived from enstatite, Granville, Mass.

Analysis by George Steiger. Serpentines C, D, E are described by Emerson in Monograph XXIX.

	A.	B.	C.	D.	E.
SiO_2	41.32	41.47	40.77	38.62	37.82
TiO_2	.....	.....	none	none	trace
Al_2O_3	.....	.....	1.16	.35	.61
Cr_2O_3	.....	.....	.28	.39	.19
Fe_2O_3	.....	1.73	3.56	3.44	7.92
FeO	2.36	.09	1.47	3.99	1.15
MnO	.....	.....	.09	.10	.....
NiO	.....	.....	.17	.21	.45
CoO	.....	.....	.....	.....	.05
CaO	.....	none	none	.40	none
MgO	41.49	41.70	39.37	40.61	37.94
Li_2O	.....	.....	trace	trace	.....
Na_2O	.....	.....	.14	.10	trace
K_2O	.....	.....	.10	.08	trace
H_2O at 110°	14.54	1.20	.49	.36	.75
H_2O above 110°		13.86	12.48	10.91	12.50
P_2O_5	.....	.....	trace	trace	trace
CO_2	.....	.....	none	.52	.....
	99.71	100.05	100.08	100.08	99.38

F. Rich, dark-green serpentine, Rowe, Mass.

G. Black serpentine containing marmolite, Atwater's quarry, Russell, Mass.

H. Blackish-green serpentine, containing much chromite, North Blandford, Mass.

I. Gray, splintery serpentine, Chester, Mass. Analyses F to I by George Steiger. Description by Emerson in Monograph XXIX.

J. Black, serpentized boltonite, Stow, Mass. Analysis by W. F. Hillebrand.

	F.	G.	H.	I.	J.
SiO_2	40.42	36.94	39.14	33.87	36.92
TiO_2	none	trace	none	none	none
Al_2O_3	1.86	.50	1.18	.77	.10
Cr_2O_3	.28	.33	.33	.38	none
Fe_2O_3	2.75	6.04	4.46	2.81	1.19
FeO	4.27	1.94	3.14	4.25	.87
MnO	trace	trace	none	.04	trace
NiO	.53	.40	.47	.33	----
CoO	trace	none	trace		----
CaO	.66	none	none	none	.59
MgO	35.95	38.35	41.45	38.57	43.99
Na_2O	.16	none	none	none	.05
K_2O		none	none	none	
H_2O at 100°	.21	.71	.34	.38	.72
H_2O above 100°	10.51	12.07	9.48	7.00	14.70
P_2O_5	trace	trace	.02	trace	trace
CO_2	1.44	1.85	none	10.82	.90
SO_3	trace	.20	none	.20	----
FeS_2	.43	----	----	----	----
	99.47	99.33	100.01	99.42	100.03

K. From Moriah, N. Y. Analysis by Charles Catlett. Described by Merrill, Proc. U. S. Nat. Mus., vol. 12, p. 596.

L. From the aqueduct shaft, New York City. Analysis by Charles Catlett. See Merrill, loc. cit., p. 598.

M. From Montville, N. J., light yellowish-green.

N. From Montville, darker green. Analyses M, N, by Charles Catlett. See Merrill, Proc., U. S. Nat. Mus., vol. 11, p. 105.

O. From Montville, massive.

P. From Montville, chrysotile. Analyses O, P, by E. A. Schneider. Discussion by Clarke and Schneider in Bulletin 78.

	K.	L.	M.	N.	O.	P.
SiO_2	39.96	39.92	42.38	40.23	42.05	42.42
Al_2O_3	1.07	.08	.07	2.18	.30	.63
Fe_2O_3	3.53	.50	.97	4.02		.62
FeO	3.85	none	.17	trace?	.10	undet.
MnO	trace					none
NiO	none					.23
CaO	none	.90		trace	.05	trace
MgO	37.61	42.52	42.14	39.46	42.57	41.01
H_2O at 105°	13.65	1.36	14.12	14.24	.96	2.04
H_2O above 105°		13.26			13.70	13.60
CO_2		1.64				
	99.67	100.18	99.85	100.13	99.73	100.55

Q. From Easton, Pa. Resembles a vermiculite. Analysis by E. A. Schneider. See Clarke and Schneider, Bulletin 90.

R. Grayish-green serpentine from Corundum Hill, North Carolina.

S. Picrolite from Buck Creek, Clay County, N. C. Analyses R and S by E. A. Schneider. See Clarke and Schneider, Bulletin 78.

T. From the river Poldnewaja, district of Syssert, Urals, Siberia. Analysis by E. A. Schneider. See Clarke and Schneider, Bulletin 113.

U. From Greenville, Plumas County, Cal. Analysis by W. H. Melville. Described by Diller in Bulletin 150.

	Q.	R.	S.	T.	U.
SiO_2	43.71	41.90	42.94	42.55	39.14
Al_2O_3	3.59	.71	5.05	1.25	2.08
Fe_2O_3	.90	.91		1.56	4.27
FeO		undet.	1.88	1.52	2.04
NiO		.10	.61		
CaO				none	trace
MgO	38.58	40.16	36.53	40.05	39.84
Na_2O	.13				
K_2O	2.22				
H_2O at 105°	.46	2.26	1.53	.21	12.70
H_2O above 105°	10.79	13.90	11.68	12.26	
Chromite				.37	.11
	100.38	99.94	100.22	99.77	100.18

V. Light-green marmolitic serpentine, New Idria, Cal.

W. Black serpentine, Sulphur Bank, California.

X. Light-green serpentine, Sulphur Bank.

Analyses V, W, X by W. H. Melville. Described by Becker in Monograph XIII. Other analyses by Melville of impure serpentines from near Mount Diablo, California, are given in Bulletin 168.

Y. From Three Brothers, Mount Stuart quadrangle, Washington. Analysis by W. F. Hillebrand.

	V.	W.	X.	Y.
SiO_2	41.54	39.64	41.86	39.00
TiO_2				trace
Al_2O_3	2.48	1.30	.69	1.75
Cr_2O_3		.29	.24	.47
Fe_2O_3				5.16
FeO	1.37	7.76	4.15	1.71
MnO		.12	.20	.15
NiO	.04	.33	trace	.10
CaO				trace
MgO	40.42	37.13	38.63	38.00
Alkalies				.10
H_2O at 110°	14.18	13.81	14.16	1.31
H_2O above 110°				12.43
P_2O_5				trace
FeS_2				.03
	100.03	100.38	99.93	100.21

GENTHITE.

From Riddle, Douglas County, Oreg. Analyzed by F. W. Clarke, and described by Diller and Clarke in Bulletin 60.

SiO_2	44.73
Al_2O_3, Fe_2O_3	1.18
MgO	10.56
NiO	27.57
H_2O at 110°	8.87
H_2O above 110°	6.99
	99.90

TALC.

Apple-green, beautifully foliated. From Huntersville, Fairfax County, Va. Analysis by E. A. Schneider.

SiO_2	62.27
Al_2O_3	.15
Fe_2O_3	.95
FeO	.85
MgO	30.95
MnO	trace
H_2O at 105°	.07
H_2O, ignition	4.84
	100.08

GLAUCONITE.

From Big Goose Canyon, 15 miles southwest of Sheridan, Big Horn Mountains, Wyoming. Analysis by George Steiger. Specific gravity, 2.73.

SiO_2	49.23
Al_2O_3	7.11
Fe_2O_3	20.89
FeO	3.06
MnO	trace
CaO	trace
MgO	3.44
Na_2O	.11
K_2O	8.51
H_2O at 100°	1.83
H_2O above 100°	4.88
	99.06

KAOLINITE.

A. From Hockessen, Del. Analysis by George Steiger.

B. From Aiken, S. C. Analysis by F. W. Clarke.

C. From Talladega, Ala. Analysis by Charles Catlett.

D. From the Eureka vein, St. Peter's Dome, near Pikes Peak, Colorado. Analysis by W. F. Hillebrand. Described by Cross and Hillebrand in Bulletin 20.

E. From New Discovery mine, Leadville, Colo. Analysis by W. F. Hillebrand.

F. From National Belle mine, Ouray County, Colo. Analysis by W. F. Hillebrand. Specific gravity, 2.611 at 18.5°. Described in Bulletin 20.

	A.	B.	C.	D.	E.	F.
SiO_2	48.73	45.56	43.21	46.06	43.66	46.35
Al_2O_3	37.02	40.25	37.27	39.63	37.78	39.59
Fe_2O_3	.79					.11
CaO	.16		.11		.22	
MgO	.11		.10		.30	
Na_2O	.04		.40		trace	
K_2O	.41		.28		trace	
H_2O at 100°	.52	14.10	5.02	13.77	17.95	13.93
H_2O above 100°	12.83		13.48			
P_2O_5	.03					
TiO_2	.17					
SO_3					trace	
F						.15
CaF_2				.68		
	100.81	99.91	99.87	100.14	99.91	100.13
O equivalent to F						.06
						100.07

HALLOYSITE.

A. From the Detroit copper mine, near Mono Lake, California. Analyzed by F. W. Clarke, and described in Bulletin 9.

B. From the Logan mine, Rico, Colo. Analysis by W. F. Hillebrand.

	A.	B.
SiO_2	42.91	38.65
Al_2O_3	38.13	33.27
Fe_2O_3		.22
H_2O at 100°	18.95	13.70
H_2O above 100°		14.34
	99.99	100.18

CIMOLITE.

Rose-red, earthy variety, from Norway, Me. Analysis by R. B. Riggs. Described by Clarke in Bulletin 42.

SiO_2	66.86
Al_2O_3	22.23
Fe_2O_3	.47
FeO	.18
MnO	.07
CaO	.42
MgO	.33
Li_2O	.29
Na_2O	.46
K_2O	.18
H_2O	8.26
F	.06
	99.81

PYROPHYLLITE.

Compact, white. From Deep River, North Carolina. Analysis by George Steiger.

SiO_2	64.73
TiO_2	.73
Al_2O_3	29.16
Fe_2O_3	.49
MgO	trace
Ignition	5.35
	100.46

BOLE.

From South Table Mountain, Golden, Colo. Described by Cross and Hillebrand in Bulletin 20. Analyses by W. F. Hillebrand.

A. Dark brown.

B. Light brown.

	A.	B.
SiO_2	42.63	46.17
Al_2O_3	18.76	22.03
Fe_2O_3	11.88	4.64
CaO	2.59	2.30
MgO	3.39	2.42
K_2O	.35	[a] 2.06
Na_2O	.24	
H_2O	20.21	20.38
	100.05	100.00

[a] By difference.

VIII. TITANATES AND TITANO-SILICATES.

ILMENITE.

From the peridotite dike of Elliott County, Ky. Described by Diller in Bulletin 38. Analysis by T. M. Chatard.

TiO_2	49.32
SiO_2	.76
Al_2O_3	2.84
Cr_2O_3	.74
Fe_2O_3	9.13
FeO	27.81
MnO	.20
CaO	.23
MgO	8.68
Alkalies	.19
P_2O_5	trace
Ignitium	.20
	100.10

XANTHITANE.

From Green River, Henderson County, N. C. Alteration product of titanite. Analyzed by L. G. Eakins, and described in Bulletin 60. Specific gravity, 2.941 at 24°. Material dried at 100°.

TiO_2	61.54
SiO_2	1.76
Al_2O_3	17.59
Fe_2O_3	4.46
CaO	.90
MgO	trace
P_2O_5	4.17
H_2O	9.92
	100.34

TITANITE.

Pale-yellow, semi-translucent. From the waterworks tunnel, Washington, D. C. Occurs embedded in prochlorite. Analysis by F. W. Clarke. Specific gravity, 3.452.

TiO_2	40.82
SiO_2	30.10
MnO	trace
CaO	28.08
MgO	.40
Ignition	.54
	99.94

TSCHEFFKINITE.

From Bedford County, Va. Analyzed by L. G. Eakins and described by him in Bulletin 90.

A. Lustrous portion. Specific gravity, 4.33 at 27°.

B. Dull portion. Specific gravity, 4.38 at 22°.2.

	A.	B.
TiO_2	18.78	18.99
SiO_2	20.21	21.49
Ta_2O_5	.08	.08
ZrO_2	trace?	trace?
ThO_2	.85	.75
$(Y,Er)_2O_3$	1.82	1.64
$(La,Di)_2O_3$	19.72	17.16
Ce_2O_3	20.05	19.08
Al_2O_3	3.60	3.65
Fe_2O_3	1.88	2.89
FeO	6.91	5.92
CaO	4.05	5.24
MgO	.55	.48
Na_2O	.06	.04
H_2O	.94	2.06
	99.50	99.47

ASTROPHYLLITE.

From St. Peter's Dome, near Pikes Peak, Colorado. Analyzed by L. G. Eakins and described by him in Bulletin 90.

TiO_2	11.40
SiO_2	35.23
ZrO_2	1.21
Ta_2O_5	.34
Fe_2O_3	3.73
Al_2O_3	trace
FeO	29.02
MnO	5.52
CaO	.22
MgO	.13
K_2O	5.42
Na_2O	3.63
H_2O	4.18
	100.03

IX. COLUMBO-TANTALATES.

SAMARSKITE.

Mineral near samarskite, from Devils Head Mountain, near Pikes Peak, Colorado. Analyzed by W. F. Hillebrand and described in Bulletin 55.

A. Pitch-black variety, streak dirty brown. Specific gravity, 6.18 at 22°.

B. Black, streak salmon colored. Specific gravity, 6.12 at 25°.

C. Altered variety. Specific gravity, 5.45 at 16°.

	A.	B.	C.
Ta_2O_5	27.03	28.11	19.34
Cb_2O_5	27.77	26.16	27.56
WO_3	2.25	2.08	5.51
SnO_2	.95	1.09	.82
ZrO_2	2.29	2.60	[a]3.10
UO_2	4.02	4.22	----------
UO_3	----------	----------	6.20
ThO_2	3.64	3.60	3.19
Ce_2O_3	.54	.49	.41
$(La, Di)_2O_3$	1.80	2.12	1.44
Er_2O_3	10.71	10.70	9.82
Y_2O_3	6.41	5.96	5.64
Fe_2O_3	8.77	8.72	8.90
FeO	.32	.35	[b].39
MnO	.78	.75	.77
ZnO	.05	.07	
PbO	.72	.80	1.07
CaO	.27	.33	1.61
MgO	----------	----------	.11
K_2O	.17	.13	.36
$(Na, Li)_2O$	.24	.17	
H_2O	1.58	1.30	3.94
F	(?)	(?)	(?)
	100.31	99.75	100.18

[a] With TiO_2.

[b] Or 0.74 UO_2.

X. BORATES.

COLEMANITE.

A. Transparent crystal, ordinary type, Death Valley, California.
B, C. Blade-like crystals, Death Valley.
D. Priceite, Curry County, Oreg.
D. Pandermite, Island of Panderma, Black Sea.
Analyses by J. E. Whitfield, with details in Bulletin 55.

	A.	B.	C.	D.	E.
B_2O_3	50.70	49.56	49.62	48.44	48.63
CaO	27.31	27.36	27.40	32.15	32.16
MgO	.10	.25	.26	.....	.....
H_2O	21.87	22.66	22.70	19.42	19.40
SiO_2	.....	.44	.47	.....	.....
	99.98	100.27	100.45	100.01	100.19

ULEXITE.

From Rhodes' Marsh, Esmeralda County, Nev. Analysis by J. E. Whitfield, with description in Bulletin 55.

B_2O_3	43.20
CaO	14.52
Na_2O	10.20
K_2O	.44
H_2O	29.46
SiO_2	.04
SO_3	.28
Cl	2.38
	100.52
O equivalent to Cl	.53
	99.99

LUDWIGITE.

From Morawitza, Banat, Hungary. Analysis by J. E. Whitfield, with description in Bulletin 55.

B_2O_3	12.04
Fe_2O_3	37.93
FeO	15.78
MgO	30.57
MnO	.16
H_2O	3.62
	100.10

WARWICKITE.

From Edenville, Orange County, N. Y. Somewhat contaminated by spinel, from which the warwickite could not be entirely freed. Analysis by J. E. Whitfield. See Bulletin 64.

B_2O_3	18.96
TiO_2	18.68
SiO_2	1.16
Al_2O_3	9.44
FeO	14.23
CaO	.38
MgO	34.41
H_2O	2.80
	100.06

XI. NITRATES.

SODA NITER.

From the Leucite Hills, Wyoming. Analysis by L. G. Eakins. The N_2O_5 was not determined directly, but calculated to satisfy Na_2O+K_2O.

Na_2O	32.09
K_2O	4.97
N_2O_5	61.58
CaO	.24
SO_3	.33
Cl	trace
H_2O	.68
	99.89

NITER.

A. From Utah, exact locality unknown. Analysis by T. M. Chatard.

B. From the Leucite Hills, Wyoming. Analysis by L. G. Eakins, with the N_2O_5 calculated to satisfy the alkalies.

	A.	B.
Insoluble matter	12.12	
K_2O	38.38	44.91
Na_2O	.12	.07
N_2O_5	44.30	51.49
SiO_2	.20	
Al_2O_3		
CaO	1.43	1.09
MgO	trace	
NaCl	.08	
Cl		.09
SO_3	2.05	1.59
H_2O	1.24	.62
	99.92	99.86

XII. PHOSPHATES.

XENOTIME.

From the gold washings at Brindletown, N. C. Analyses by L. G. Eakins.

A. Green, specific gravity, 4.68 at 24.2°.

B. Brown, specific gravity, 4.46 at 24.4°.

	A.	B.
SiO_2	3.46	3.56
ZrO_2	1.95	2.19
UO_2	4.13	1.73
ThO_2	trace	trace
Al_2O_3	.77	1.57
Fe_2O_3	.65	2.79
$(La,Di)_2O_3$	.93	.77
$(Y,Er)_2O_3$ [a]	56.81	55.43
CaO	.21	.19
P_2O_5	30.31	29.78
F	.06	.56
H_2O	.57	1.49
	99.85	100.06

[a] Molecular weight, 260.

APATITE.

Dark-green, massive apatite from the topaz locality at Stoneham, Me. Analysis by J. E. Whitfield. See Bulletin 27. Specific gravity, 3.27.

P_2O_5	40.36
CaO	47.60
MgO	6.08
FeO	1.44
H_2O	.11
Cl	.29
F	6.84
	102.72
Excess O	2.94
	99.78

TRIPLITE.

From a tin mine near Rapid City, S. Dak. Probably identical with Headden's "griphite." Analysis by L. G. Eakins, with description in Bulletin 60.

P_2O_5	39.68
SiO_2	.43
Al_2O_3	8.74
Fe_2O_3	2.36
FeO	1.97
MnO	29.13
CaO	6.72
MgO	trace
Li_2O	.13
Na_2O	5.25
K_2O	trace
H_2O	3.67
CO_2	.26
F	2.35
Cl	.25
	100.94
Excess O	1.05
	99.89

TURQUOISE.

From Los Cerillos, N. Mex. Described by Clarke and Diller in Bulletin 42. Analyses by F. W. Clarke.

A. Bright blue, faintly translucent in thin splinters.

B. Pale blue, with a slight greenish cast. Opaque and earthy in texture. Specific gravity, 2.805.

C. Dark green, opaque.

	A.	B.	C.
P_2O_5	31.96	32.86	28.63
SiO_2	1.15	.16	4.20
Al_2O_3	39.53	36.88	37.88
Fe_2O_3		2.40	4.07
CuO	6.30	7.51	6.56
CaO	.13	.38	undet.
H_2O	19.80	19.60	18.49
	98.87	99.79	99.83

XIII. VANADATES.

DESCLOIZITE.

A. From the Mayflower mine, Bald Mountain mining district, Beaverhead County, Mont. Yellow, friable, not crystallized.

B. From the Commercial mine, Georgetown, N. Mex. Brilliantly crystallized.

C. Cuprodescloizite from the Lucky Cuss mine, Tombstone, Ariz. Specific gravity, 5.88 at 19°.

Analyses by W. F. Hillebrand, with description in Bulletin 64.

	A.	B.	C.
V_2O_5	20.80	20.44	19.79
As_2O_5	.32	.94	1.10
P_2O_5	.27	.26	.19
SiO_2	.18	1.01	.80
CO_2	----------	----------	.82
PbO	55.93	56.01	57.00
ZnO	15.94	17.73	4.19
CuO	1.15	1.05	11.21
FeO	.70	.07	trace
CaO	.10	.04	1.01
MgO	.06	.03	.04
K_2O	----------	----------	.10
Na_2O	----------	----------	.17
H_2O	4.37	2.45	2.50
Cl	----------	.04	.07
	99.82	100.07	98.99

CARNOTITE.

From Montrose County, Colo. See memoir by Hillebrand and Ransome, Am. Jour. Sci., 4th ser., vol. 10, p. 120.

A, B, C. From Copper Prince claim, Roc Creek.

D, E. From Yellow Boy claim, La Sal Creek.

Analyses by W. F. Hillebrand.

	A.	B.	C.	D.	E.
V_2O_5	18.35	18.49	15.76	17.80	18.05
As_2O_5	.25	trace	none	none	none
P_2O_5	.33	.80	.40	trace	.05
SiO_2	------	.15	.13	5.05	.20
TiO_2	.10	.03	(?)	------	(?)
CO_2	.33	.56	none	------	none
SO_3	.12	------	.18	------	none
UO_3	52.25	54.89	47.42	52.28	54.00
MoO_3	.23	.18	.18	undet.	.05
CrO_3	trace	------	------	------	------
Fe_2O_3	1.77	.21	.72	3.36	.42
Al_2O_3	1.08	.09	.08	undet.	.29
PbO	.25	.13	.18	undet.	.07
CuO	.20	.15	.22	------	trace
CaO	2.85	3.34	2.57	1.85	1.86
SrO	------	.02	(?)	------	trace
BaO	.72	.90	.65	3.21	2.83
MgO	.20	.22	.24	.17	.14
Li_2O	none	trace	(?)	trace	trace
Na_2O	.09	.14	.07	.07	.13
K_2O	6.73	6.52	6.57	5.32	5.46
H_2O at 105°	2.59	2.43	1.85	4.52	3.16
H_2O above 105°	3.06	2.11	2.79	3.87	2.21
Insoluble	8.34	7.10	19.00	------	10.33
	99.84	98.46	99.01	97.50	99.25

XIV. ARSENATES AND ANTIMONATES.

OLIVENITE.

From the American Eagle mine, Tintic mining district, Utah. Described by Hillebrand in Bulletin 20. Analysis by W. F. Hillebrand.

As_2O_5	40.05
P_2O_5	.06
CuO	55.40
Fe_2O_3	.25
CaO	.16
ZnO	trace
H_2O	3.39
Quartz	.40
	99.71

ERINITE.

From the Mammoth mine, Tintic district, Utah. Described by Hillebrand and Washington in Bulletin 55. Analyses by W. F. Hillebrand.

	A.	B.
As_2O_5	33.53	31.91
P_2O_5	.10	----------
CuO	57.67	57.51
ZnO	1.06	.59
CaO	.32	.51
MgO	trace	trace
Fe_2O_3	.14	.20
H_2O	7.22	9.15
	100.04	99.87

CLINOCLASITE.

From the Mammoth mine, Tintic district, Utah. Described by Hillebrand and Washington in Bulletin 55. Analyses by W. F. Hillebrand. Specific gravity, 4.38 at 19°.

	A.	B.
As_2O_5	29.59	29.60
P_2O_5	.05	[a].05
SiO_2	.06	[a].06
CuO	62.34	62.54
ZnO	.06	.04
Fe_2O_3	.12	.12
H_2O	7.73	7.72
	99.95	100.13

[a] Assumed the same as in A.

CONICHALCITE.

From the American Eagle mine, Tintic district, Utah. Analysis by W. F. Hillebrand, with description in Bulletin 20.

As_2O_5	39.94
P_2O_5	.14
CO_2 (by difference)	.97
CuO	28.68
ZnO	2.86
CaO	19.79
MgO	.54
Fe_2O_3	.36
Ag	.30
H_2O	5.52
Quartz	.90
	100.00

TYROLITE.

From the Mammoth mine, Tintic district, Utah. Described by Hillebrand and Washington in Bulletin 55. Analyses by W. F. Hillebrand. Specific gravity, 3.27 at 20°.5.

	A.	B.
As_2O_5	28.78	26.22
P_2O_5	trace	trace
CuO	45.22	46.38
ZnO	.04	trace
CaO	6.84	6.69
MgO	.05	.04
H_2O	17.26	17.57
SO_3	(?)	2.27
	98.19	99.17

CHENEVIXITE.

From the American Eagle mine, Tintic district, Utah. Analyzed by W. F. Hillebrand and described in Bulletin 20.

As_2O_5	35.14
CuO	26.31
CaO	.44
MgO	.16
Fe_2O_3	27.37
Al_2O_3	.66
H_2O	9.33
Quartz	.40
	99.81

MIXITE.

From the Mammoth mine, Tintic district, Utah. Described by Hillebrand and Washington in Bulletin 55. Analysis by W. F. Hillebrand.

As_2O_5	28.79
P_2O_5	.06
SiO_2	.42
CuO	43.89
ZnO	2.70
CaO	.26
Bi_2O_3	11.18
Fe_2O_3	.97
H_2O	11.04
	99.31

SCORODITE.

An incrustation on hot spring deposits, from Joseph's Coat Spring, Broad Creek, Yellowstone Park. Analyzed by J. E. Whitfield and described in Bulletin 55.

As_2O_5	46.48
Fe_2O_3	33.29
H_2O	15.50
SiO_2	4.35
SO_3	.84
	100.46

BINDHEIMITE.

From a claim near the Bertrand mine, Secret Canyon, Nevada. Analyzed by W. F. Hillebrand and described in Bulletin 20. Specific gravity, 5.01 at 19°, after correction for admixed quartz and cerussite.

Sb_2O_5	35.20
PbO	49.50
CuO	.58
ZnO	.18
CaO	.66
MgO	.03
K_2O	.14
Na_2O	.21
Fe_2O_3	.09
Ag	.29
CO_2	3.35
H_2O	5.86
Quartz	4.59
	100.68

XV. SULPHATES AND TELLURITES.

GYPSUM.

A. From Hillsboro, New Brunswick. Analysis by George Steiger.

B. From the Western Plaster Works, Alabaster, Mich. Analysis by George Steiger.

C. From east of Cascade, Black Hills, South Dakota. Analysis by George Steiger.

D. From Rico-Aspen mine, Rico district, Colorado. Analysis by W. F. Hillebrand.

E, F. From Nephi, Utah. Analyses by E. T. Allen. Some anhydrite must be present.

	A.	B.	C.	D.	E.	F.
SO_3	46.18	46.18	45.45	45.07	48.14	39.53
CO_2			.85	1.54	.65	7.73
Cl	trace	.03			trace	.04
SiO_2			.10	.51		
TiO_2				trace		
Al_2O_3	.10	.08	.12	.03		.14
Fe_2O_3				.09		
CaO	32.37	32.33	32.44	32.49	35.29	38.46
SrO				.10		
MgO	trace	.05	.33	.92	trace	.24
Na_2O	.10	.14		trace		.07
K_2O						.19
H_2O	20.94	20.96	20.80	19.67	15.88	12.69
Insoluble	.10	.05				.45
Organic matter				present		
	99.79	99.82	100.09	100.42	99.96	99.54

BROCHANTITE.

From the United Verde mine, Jerome, Ariz. Analysis by W. F. Hillebrand.

SO_3	16.75
CuO	69.45
PbO	.04
Fe_2O_3 (from gangue)	.28
CaO	trace
H_2O	12.05
P_2O_5	trace
CO_2	.71
Insoluble	.70
	99.98

ANTLERITE.

From the Antler mine, Yucca Station, Mohave County, Ariz. Described by Hillebrand as a new species in Bulletin 55. Specific gravity, 3.93 at 16°, corrected for gangue. Analyses by W. F. Hillebrand.

A, B. First lot received.

C. Later sample.

	A.	B.	C.
SO_3	18.78	18.48	20.11
CuO	62.48	62.69	63.26
ZnO	.27	.27	.04
CaO	.06	.05	.04
MgO	.03	.03	----------
Al_2O_3, Fe_2O_3	.14	.12	.15
SiO_2	.06	undet	.05
H_2O	10.21	10.18	10.05
Insoluble gangue	8.01	8.02	6.27
	100.04	99.84	99.97

PISANITE.

From Bingham, Utah. Analysis by W. F. Hillebrand.

SO_3	28.52
CuO	12.60
FeO	14.13
ZnO	.10
H_2O	44.92
	100.27

PICRALLUMOGENE.

From near Las Vegas, N. Mex. Analysis by W. F. Hillebrand.

SO_3	37.51
Al_2O_3	9.71
MnO	.06
MgO	6.75
Na_2O	2.09
K_2O	.28
H_2O	43.75
	100.15

HALOTRICHITE.

From the headwaters of Gila River, Grant County, N. Mex., about 40 miles north of Silver City. Analyzed by F. W. Clarke, and described in Bulletin 9.

SO_3	37.19
Al_2O_3	7.27
FeO	13.59
H_2O	40.62
Insoluble	.50
	99.17

ALUNOGEN.

A. From headwaters of Gila River, Grant County, N. Mex., about 40 miles north of Silver City. Analyzed by F. W. Clarke, and described in Bulletin 9. Color, pinkish.

B. From the calcite spring, Yellowstone Park. Fine, white, silky fibers. Analysis by J. E. Whitfield.

C. From the Grand Canyon, Yellowstone Park. Analysis by J. E. Whitfield.

	A.	B.	C.
SO_3	34.43	40.65	38.22
Al_2O_3	15.52	15.72	16.80
Fe_2O_3	----------	trace	trace
CaO	----------	trace	none
MgO	----------	1.53	.18
K_2O	----------	----------	.01
Na_2O	----------	----------	.63
H_2O	42.56	41.81	43.64
SiO_2	----------	.09	1.38
Insoluble	7.62	----------	----------
	100.13	99.80	100.86

COPIAPITE.

A. From the Redington mine, Knoxville, Cal.

B. From Sulphur Bank, Lake County, Cal.

Analyses by W. H. Melville. Description by Melville and Lindgren in Bulletin 61.

	A.	B.
SO_3	39.97	38.82
Al_2O_3	.....	.37
Fe_2O_3	26.54	26.79
FeO	.46	3.28
MnO	.21	trace
CaO	.....	.25
MgO	3.06	.16
H_2O	30.43	29.58
Residue	.....	.75
	100.67	100.00

KNOXVILLITE.

From the Redington mine, Knoxville, Cal. Described as a new species by Melville and Lindgren in Bulletin 61. Analysis by W. H. Melville.

SO_3	35.91
Cr_2O_3	7.41
Al_2O_3	4.83
Fe_2O_3	15.36
FeO	3.81
NiO	.83
MgO	3.22
H_2O at 100°	9.30
H_2O above 100°	17.60
Residue	1.73
	100.00

REDINGTONITE.

From the Redington mine, Knoxville, Cal. Described as a new species by Melville and Lindgren in Bulletin 61. Analysis by W. H. Melville. Specific gravity, 1.761.

SO_3	35.35
Cr_2O_3	7.51
Al_2O_3	5.14
Fe_2O_3	.19
FeO	4.58
NiO	1.00
MnO	trace
MgO	1.85
H_2O at 100°	27.09
H_2O above 100°	14.34
Residue	3.46
	100.51

ALUNITE.

A. From Knickerbocker Hill, Custer County, Colo. Analysis by L. G. Eakins.

B. From Tres Cerritos Buttes, southwest of Indian Gulch, Mariposa County, Cal. Analysis by William Valentine.

	A.	B.
SO_3	35.91	38.50
Al_2O_3	38.91	38.05
Fe_2O_3	----------	.23
CaO	.35	.55
MgO	trace	trace
K_2O	4.03	4.48
Na_2O	4.32	2.78
H_2O	13.03	11.92
SiO_2	2.82	2.64
TiO_2	----------	.40
P_2O_5	----------	trace
	99.37	99.55

JAROSITE.

A. From Black Iron mine, Eagle County, Colo.

B. From Pigeon mine, Rico district, Colorado.

Analyses by W. F. Hillebrand.

	A.	B.
SO_3	30.72	28.20
Fe_2O_3	46.37	43.81
PbO	1.80	----------
MgO	trace	trace
CaO	----------	.06
K_2O	8.14	7.44
Na_2O	.27	.08
H_2O	11.40	11.64
Al_2O_3	----------	1.00
P_2O_5	----------	.33
As_2O_5	.51	----------
SiO_2	.72	7.35
	99.93	99.91

NATROJAROSITE.

From Soda Springs Valley, on road from Sodaville to Vulcan copper mine, Nevada. Described by Hillebrand and Penfield in Am. Jour. Sci., 4th ser., vol. 14, p. 211. Analysis by W. F. Hillebrand. Specific gravity, 3.18 at 30.5°.

SO_3	30.96
Fe_2O_3	50.98
CaO	.04
K_2O	.35
Na_2O	6.03
H_2O at 105°	.12
H_2O above 105°	11.03
SiO_2	.23
As_2O_5	.20
	99.94

PLUMBOJAROSITE.

From Cooks Peak, New Mexico. Described as a new species by Hillebrand and Penfield in Am. Jour. Sci., 4th ser., vol. 14, p. 211. Analysis by W. F. Hillebrand. Specific gravity, 3.668 at 30.5°.

SO_3	27.06
Fe_2O_3	42.37
Al_2O_3?	.10
PbO	19.84
CuO	.27
CaO	.05
MgO	.01
K_2O	.17
Na_2O	.21
H_2O at 105°	.02
H_2O above 105°	9.54
SiO_2	.51
	100.15

EMMONSITE.

A hydrous ferric tellurite from near Tombstone, Ariz. Analyzed partially by W. F. Hillebrand, and described by him as a new species in Proc. Colorado Sci. Soc., vol. 2, pt. 1, p. 21. The data relative to the composition of emmonsite are as follows:

	I.	II.	III.	IV.
Te(Se)	59.77	59.15	59.05	59.14
Fe	14.00	14.06	14.90	14.20
ZnO				1.94
CaO				.56
H_2O	3.28			

XVI. MOLYBDATES, TUNGSTATES, AND URANATES.

POWELLITE.

From the Seven Devils mining district, Idaho. Analyzed by W. H. Melville, and described by him as a new mineral species in Bulletin 90. Specific gravity, 4.526.

MoO_3	58.58
WO_3	10.28
CaO	25.55
MgO	.16
Fe_2O_3	1.65
Al_2O_3	trace
CuO	trace
SiO_2	3.25
S	undet.
	99.47

HÜBNERITE.

From the Royal Albert vein, Uncompahgre district, Ouray County, Colo. Analyzed by W. F. Hillebrand, and described by him in Bulletin 20. Specific gravity, 7.177 at 24°.

WO_3	75.58
Cb_2O_5 (?)	.05
SiO_2	.62
MnO	23.40
FeO	.24
CaO	.13
	100.02

URANINITE.

Analyses by W. F. Hillebrand. Discussed in Bulletins 78 and 90. In the original publications the gaseous constituent of uraninite was supposed to be nitrogen, as indeed it was in part. The discovery of helium, however, has shed new light upon the subject, and the analyses have been corrected accordingly,

A, B, C, D, E. Crystallized uraninite from Hale's quarry, Glastonbury, Conn. Nitrogen was certainly present in these specimens.

	A.	B.	C.	D.	E.
UO_3	22.08	23.35	22.22	26.48	23.03
UO_2	59.13	58.01	59.31	57.43	59.93
ThO_2				9.79	
CeO_2		9.78		.25	
ZrO_2?	9.57		10.31		11.10
$(LaDi)_2O_3$				.13	
$(YEr)_2O_3$		.46		.20	
PbO	3.14	3.24	3.07	3.26	3.08
CaO	.08		undet.	.08	.11
MgO			undet.		
Alkalies			undet.	trace	
H_2O	.97	undet.	undet.	.61	.43
He, etc	undet.	undet.	undet.	undet.	.34
Fe_2O_3	1.21	.33	.67	.40	.29
MnO				trace	
SiO_2	1.06		.25	.16	.16
P_2O_5					.02
F					.04
Insoluble	.85	1.74	.42	.70	.89
Cb_2O_5	.96				
	99.05	96.91	96.25	99.49	99.42
Specific gravity	9.139	9.051		9.587	9.622

F, G, H. Brilliantly crystallized, from Branchville, Conn.

I, J. Altered uraninite, from the Flat Rock mine, Mitchell County, N. C.

K. Massive, from near Blackhawk, Colo.

L. From Marietta, S. C.

	F.	G.	H.	I.	J.	K.	L.
UO_3	13.27	21.54	14.00	50.83	44.11	25.26	83.95
UO_2	72.25	64.72	70.99	39.31	46.56	58.51	
TiO_2						trace	
ZrO_2	7.20	.33	6.52			7.59	.20
ThO_2		6.93		2.78			1.65
CeO_2				.26	3.04	.22	.19
$(LaDi)_2O_3$				.50			2.05
$(YEr)_2O_3$				.20			6.16
PbO	4.35	4.34	4.35	4.20	4.53	.70	3.58
ZnO						.44	
FeO				trace		.32	
Fe_2O_3	.11	.28	.27				trace
MnO	.10	.07	(?)			.16	
CaO	.18	.22	.30	.85	.23	.84	.41
MgO			.15	.30	.25	trace?	trace
Alkalies						trace?	trace
H_2O	.68	.67	.68	1.21	undet.	1.96	undet.
He, etc	undet.	undet.	.38	.05	undet.	.02	undet.
SiO_2	.03	.13	.20	.08	.13	2.79	
P_2O_5				(?)		.22	
As_2O_5						.43	
$CuFeS_2$						.12	
FeS_2						.24	
Insoluble	.04	.14	1.40	.10	.06		.20
	98.21	99.37	99.24	100.67	98.91	99.82	98.39
Specific gravity	9.733	9.560	9.348	8.086	9.492	8.068	

M. Nivenite from Llano County, Tex.

N. Somewhat altered uraninite from Villeneuve, Province of Quebec, Canada.

O. Massive uraninite from Johanngeorgenstadt, Saxony.

	M.	N.	O.
UO_3	20.89	34.67	22.33
UO_2	44.17	41.06	59.30
ThO_2	6.69	6.41	
ZrO_2	.34	(?)	
CeO_2	.34	.40	none
$(La, Di)_2O_3$	2.36	1.11	
$(Y, Er)_2O_3$	9.46	2.57	
CaO	.32	.39	1.00
PbO	10.08	11.27	6.39
H_2O	1.48	1.47	3.17
He, etc	.08	.10	trace
SiO_2	.46	.19	.50
Fe_2O_3	.14	.10	.21
Al_2O_3 ?			.20
MgO			.17
Na_2O			.31
Bi_2O_3		.09	.75
CuO			.17
MnO			.09
P_2O_5			.06
As_2O_5			2.34
V_2O_5, MoO_3, WO_3			.75
SO_3			.19
Insoluble	1.47	.13	
	98.28	99.96	97.93
Specific gravity	8.29		6.89

The following uraninites are all from Norway, and were analyzed for comparison with the American material.

P. Bröggerite from Anneröd, near Moss. Specific gravity, 8.893.
Q. From Elvestad. Specific gravity, 9.145.
R. From Elvestad. Specific gravity, 8.320.
S. From Skraatorp. Specific gravity, 8.966.
T. From Huggenäskilen. Specific gravity, 8.930.
U. Cleveite from Arendal. Specific gravity, 7.500.
V. From Arendal.

	P.	Q.	R.	S.	T.	U.	V.
UO_3	30.63	25.36	22.04	32.00	35.54	41.71	26.80
UO_2	46.13	50.74	43.03	43.88	43.38	24.18	44.18
ZrO_2?	.06	.08					
ThO_2	6.00	8.48		8.98	6.63	3.66	4.15
CeO_2	.18	.21	8.43	.17	.20		none
$(La, Di)_2O_3$	.27	.26		.36	.23		.67
$(Y, Er)_2O_3$	1.11	1.10		.97	1.03	9.76	9.05
PbO	9.04	10.06	8.58	9.46	9.44	10.54	10.95
CaO	.37	.77	.37	.36	.41	1.06	.61
MgO	traces	traces	.13	traces	.13	.10	.04
Alkalies						.23	.15
H_2O	.74	.73	.74	.77	.79	1.23	undet.
He, etc	.17	.18	.15	.15	.15	undet.	.18
Fe_2O_3	.25	.21	.30	.09	.32	.03	.24
MnO		.06					
SiO_2	.22	.38	.29	.53	.49	.90	.50
P_2O_5	.02	.04	trace	(?)	trace		trace
Insoluble	4.42	.45	15.45	1.54	.42	1.10	1.19
	99.61	99.11	99.51	99.26	99.16	94.50	98.71

INDEX.

O

PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

[Bulletin No. 220.]

The serial publications of the United States Geological Survey consist of (1) Annual Reports, (2) Monographs, (3) Professional Papers, (4) Bulletins, (5) Mineral Resources, (6) Water-Supply and Irrigation Papers, (7) Topographic Atlas of the United States—folios and separate sheets thereof, (8) Geologic Atlas of the United States—folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists may be had on application.

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