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REPORT OF THE INTERNATIONAL COMMITTEE ON ATOMIC WEIGHTS FOR 1920–21.

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Since the report of this committee for the preceding year was prepared, only a few new determinations of atomic weights have been published. They may be summarized as follows.

Fluorine.—Moles and Batuecas[1] have made 23 determinations of the density of methyl fluoride, CH_3F. For the weight of a normal liter of the gas they find, in mean, 1.54542 g. From this the molecular weight, 34.024 is deduced, and F = 18.996. This rounded off to 19, is the value already accepted.

Silicon.—Baxter, Weatherill and Holmes,[2] from analyses of silicon tetrachloride, find Si = 28.111. This determination, however, is not regarded by the authors as final. Its acceptance, therefore, must await confirmation, especially as the value is much lower than that given in the present table of atomic weights.

Lead.—The atomic weight of isotopic lead from thorium minerals has been determined by Hönigschmid.[3] For lead from Norwegian thorite he finds Pb = 207.88 to 207.92. For lead from Ceylonese thorianite,

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[1] *J. chim. phys.*, **17**, 538 (1919).

[2] Baxter, Weatherill and Holmes, THIS JOURNAL, **42**, 1194 (1920).

[3] Hönigschmid, *Z. Elektrochem.*, **25**, 91 (1919).

Pb = 206.88 to 207.24. In thorianite there is evidently a mixture of isotopes, and perhaps also of normal lead.

Richards and Sameshima[1] have examined lead from a radioactive Japanese mineral. The values found for the atomic weight were 207.11, 207.12 and 207.15. For ordinary lead the corresponding value was 207.184. The Japanese material, evidently, contained very little isotopic lead.

Tin.—In two papers Brauner and Krepelka[2] give new determinations of the atomic weight of tin based upon analyses of the tetrabromide. In the first paper, which is preliminary, they find Sn = 118.70. In the second, by Krepelka alone, the value Sn = 118.699. This confirms the earlier determinations by Briscoe and by Baxter and Starkweather. The work of the last named chemists appears in full in the same number of the JOURNAL. It was noticed in our last report from a preliminary publication.

Tellurium.—From analyses of the hydride, TeH_2, Bruylants and Michielsen[3] find for tellurium the value Te = 127.73, 127.79, and 127.4. The last value they reject. As these determinations are preliminary they need no further consideration now.

Scandium.—Meyer and Schweig,[4] after a study of methods for the purification of their material, give determinations of the atomic weight of scandium by the usual sulfate method. They found Sc = 45.03–45.37, in mean 45.23, but conclude that the method is untrustworthy. Hönigschmid,[5] with some of the same material, prepared scandium bromide and determined its ratio to silver. In 18 concordant analyses he found Sc = 45.099, which may be rounded off to 45.1. This value is accepted by Meyer and Schweig, and should be adopted.

Samarium.—The atomic weight of samarium has been determined by Owens, Balke and Kremers[6] by analyses of the anhydrous chloride. From the mean of 18 concordant analyses, Sa = 150.43, in close agreement with the determinations by Stewart and James, 150.44, which was noticed in our report of last year.

Apart from the actual determination of atomic weights 3 papers relative to the reduction of the experimental data deserve attention. Guye,[7] in one paper, has discussed the application of Avogadro's law to this problem. In a second paper[8] he has examined the data relative to bro-

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[1] Richards and Sameshima, THIS JOURNAL, **42**, 929 (1920).

[2] Brauner and Krepelka; Krepelka, *ibid.*, **42**, 917, 928 (1920).

[3] Bruylants and Michielsen, *Bull. Acad. Belg.*, Classe des Sciences, Nos. 2–3, 119 (1919).

[4] Meyer and Schweig, *Z. anorg. allgem. Chem.*, **108**, 303 (1919).

[5] Hönigschmid, *Z. Elektrochem.*, **25**, 93 (1919).

[6] Owens, Balke and Kremers, THIS JOURNAL, **42**, 515 (1920).

[7] Guye, *J. chim. phys.*, **17**, 171 (1919).

[8] Guye, *ibid.*, **17**, 141 (1919).

mine and silver, and concludes that Br = 79.92 and Ag = 107.87. The last figure differs from the value 107.88, as given in the table by only 0.01, which is quite within the limits of experimental uncertainty. The third paper, by Van Laar,[1] relates to the method of calculating atomic weights.

INTERNATIONAL ATOMIC WEIGHTS, 1921.

	Symbol.	Atomic weight.		Symbol.	Atomic weight.
Aluminum	Al	27.1	Molybdenum	Mo	96.0
Antimony	Sb	120.2	Neodymium	Nd	144.3
Argon	A	39.9	Neon	Ne	20.2
Arsenic	As	74.96	Nickel	Ni	58.68
Barium	Ba	137.37	Niton (radium emanation)	Nt	222.4
Bismuth	Bi	208.0	Nitrogen	N	14.008
Boron	B	10.9	Osmium	Os	190.9
Bromine	Br	79.92	Oxygen	O	16.00
Cadmium	Cd	112.40	Palladium	Pd	106.7
Calcium	Ca	40.07	Phosphorus	P	31.04
Carbon	C	12.005	Platinum	Pt	195.2
Cerium	Ce	140.25	Potassium	K	39.10
Cesium	Cs	132.81	Praseodymium	Pr	140.9
Chlorine	Cl	35.46	Radium	Ra	226.0
Chromium	Cr	52.0	Rhodium	Rh	102.9
Cobalt	Co	58.97	Rubidium	Rb	85.45
Columbium	Cb	93.1	Ruthenium	Ru	101.7
Copper	Cu	63.57	Samarium	Sa	150.4
Dysprosium	Dy	162.5	Scandium	Sc	45.1
Erbium	Er	167.7	Selenium	Se	79.2
Europium	Eu	152.0	Silicon	Si	28.3
Fluorine	F	19.0	Silver	Ag	107.88
Gadolinium	Gd	157.3	Sodium	Na	23.00
Gallium	Ga	70.1	Strontium	Sr	87.63
Germanium	Ge	72.5	Sulfur	S	32.06
Glucinum	Gl	9.1	Tantalum	Ta	181.5
Gold	Au	197.2	Tellurium	Te	127.5
Helium	He	4.00	Terbium	Tb	159.2
Holmium	Ho	163.5	Thallium	Tl	204.0
Hydrogen	H	1.008	Thorium	Th	232.15
Indium	In	114.8	Thulium	Tm	168.5
Iodine	I	126.92	Tin	Sn	118.7
Iridium	Ir	193.1	Titanium	Ti	48.1
Iron	Fe	55.84	Tungsten	W	184.0
Krypton	Kr	82.92	Uranium	U	238.2
Lanthanum	La	139.0	Vanadium	V	51.0
Lead	Pb	207.20	Xenon	Xe	130.2
Lithium	Li	6.94	Ytterbium (Neoytterbium)	Yb	173.5
Lutecium	Lu	175.0	Yttrium	Yt	89.33
Magnesium	Mg	24.32	Zinc	Zn	65.37
Manganese	Mn	54.93	Zirconium	Zr	90.6
Mercury	Hg	200.6			

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[1] Van Laar, *J. chim. phys.*, 17, 266 (1919).

The only change in the table of atomic weights is in the case of scandium; from 44.1 to 45.1; which appears to be fully justified by the evidence.

Signed, F. W. CLARKE,
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[CONTRIBUTION FROM THE CHEMICAL LABORATORIES OF NEW HAMPSHIRE COLLEGE.]

A NEW METHOD FOR THE DETERMINATION OF ZIRCONIUM.

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The increased commercial development of zirconium and its compounds during the last two or three years has called for far more accurate determinations of the dioxide than nearly all the older methods would give. Heretofore, in practically every instance the study of the quantitative separation of an element, keeps ahead of its industrial application. It seems reasonable to state, in the case of the element under discussion, that, up to the present time, there has been only one method, that employing nitroso-phenylhydroxylamine (cupferron), which has given absolutely reliable results.

Sodium thiosulfate has probably been the precipitant most commonly employed until comparatively recently. This method separates zirconium from iron very nicely when carried out under the proper conditions. However, since thorium, aluminum, titanium and phosphoric acid were precipitated by this reagent also, the results obtained were often as much as several per cent. too high.

Precipitation as the phosphate by sodium phosphate in the presence of hydrogen peroxide possesses an advantage in that titanium is held up. A considerable excess of hydrogen peroxide must be present and a second precipitation is advised. Unfortunately the solubility of the phosphate is affected by sulfuric acid; the second precipitation involves several tedious operations and the precipitate is not any too well defined.

The cupferron method, which is an excellent one, precipitates both zirconium and titanium together, iron having been previously removed. The solution should have 10% of free sulfuric acid present. If the original material contains only a few per cent. of phosphoric acid, a negligible amount of the latter will be found in the precipitate. The amount of titanium dioxide present must be determined either colorimetrically by hydrogen peroxide or by zinc reduction and subsequent titration. Tantalum and columbium, which occur in some varieties of zirkite, are precipitated by cupferron in the presence of large amounts of conc. sulfuric acid. It is, therefore, necessary to make sure that these elements are absent.