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ANNUAL REPORT OF THE INTERNATIONAL COMMITTEE ON ATOMIC WEIGHTS, 1916.

Received September 13, 1915.

Although many scientific activities have been interrupted by the European war, a fair number of atomic-weight determinations have appeared since the report for 1915 was prepared. They are, briefly, as follows:

Carbon.—Richards and Hoover[1] neutralized sodium carbonate with hydrobromic acid which had been standardized against silver. In this way the ratio of carbonate to silver was determined. With Ag = 107.88, Br = 79.916 and Na = 22.995, C = 12.005.

Sulfur.—Atomic weight also determined by Richards and Hoover,[2] who measured the ratio between sodium carbonate and sulfate. With the values previously assigned to sodium and carbon, S = 32.060.

Iodine.—By the direct analysis of iodine pentoxide, Guichard[3] finds I = 126.92.

Copper.—The electrolytic ratio between copper and silver has been remeasured by Shrimpton,[4] with Ag = 107.88, Cu = 63.563, as the mean of ten determinations.

[1] THIS JOURNAL, **37**, 95.
[2] *Ibid.*, **37**, 108.
[3] *Compt. rend.*, **159**, 185.
[4] *Proc. Phys. Soc. London*, **26**, 292.

Nickel.—Oechsner de Coninck and Gerard,[1] by reduction of nickel oxalate in hydrogen, find Ni = 58.57. Few details are given.

Cadmium.—By the electrolysis of cadmium chloride Baxter and Hartmann[2] find Cd = 112.417. This confirms the earlier work of Baxter and his colleagues, and gives cadmium a much higher value than was found by Hulett.

Mercury.—By the synthesis of mercuric bromide Baker and Watson[3] find Hg = 200.57, when Br = 79.92. This value is near that found by Easley.

Lead.—By the analysis of lead bromide Baxter and Thorvaldsen[4] find Pb = 207.19. With the chloride, Baxter and Grover[5] obtained the value 207.21, and with the bromide, 207.19. These determinations were made with *normal* lead from widely separated and dissimilar sources, and are highly concordant.

The value Pb = 207.20 will be adopted in the table of atomic weights.

Lead from radioactive minerals, however, has been found to differ in atomic weight from ordinary lead. For lead from thorite Soddy and Hyman[6] found atomic weights ranging from 208.3 to 208.5. Maurice Curie[7] studied lead from pitchblende, carnotite, and yttrotantalite, and obtained values from 206.36 to 206.64. Lead from monazite and galena was more nearly normal. Hönigschmid and Horowitz[8] studied lead from pitchblende, and by analyses of the chloride found Pb = 206.735. Richards and Lembert[9] made six series of analyses of lead chloride prepared with lead derived from carnotite, thorianite, pitchblende and uraninite, the mean values being Pb = 206.59, 206.81, 206.83, 206.57, 206.86, and 206.36. These figures, although each series is concordant within itself, show that radio lead is variable in its atomic weight, and that the single, definite metal is yet to be completely isolated. Indeed, the relations between radio lead (or leads) and ordinary lead are still obscure.

Tin.—Briscoe,[10] by analyses of the tetrachloride $SnCl_4$ finds Sn = 118.70, when Ag = 107.88 and Cl = 35.457. This new value, which was determined with all modern precautions, will be adopted in the table.

Tantalum.—Sears and Balke,[11] in a preliminary series of determinations

[1] *Compt. rend.*, **158**, 1345.
[2] THIS JOURNAL, **37**, 113.
[3] *J. Chem. Soc.*, **107**, 63.
[4] THIS JOURNAL, **37**, 1021.
[5] *Ibid.*, **37**, 1027.
[6] *J. Chem. Soc.*, **105**, 1402.
[7] *Compt. rend.*, **158**, 1676.
[8] *Z. Electrochem.*, **20**, 457.
[9] THIS JOURNAL, **36**, 1329.
[10] *J. Chem. Soc.*, **107**, 63.
[11] THIS JOURNAL, **37**, 830.

of the ratio between $TaCl_5$ and Ag, obtained values for Ta ranging between 180.90 and 182.14. The research is to be continued.

Praseodymium.—Baxter and Stewart,[1] in a long series of concordant analyses of the chloride $PrCl_3$, find Pr = 140.92. The rounded-off figure 140.9 will be adopted here.

INTERNATIONAL ATOMIC WEIGHTS, 1916.

	Symbol.	Atomic weight.		Symbol.	Atomic weight.
Aluminum	Al	27.1	Molybdenum	Mo	96.0
Antimony	Sb	120.2	Neodymium	Nd	144.3
Argon	A	39.88	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	14.01
Boron	B	11.0	Osmium	Os	190.9
Bromine	Br	79.92	Oxygen	O	16.00
Cadmium	Cd	112.40	Palladium	Pd	106.7
Caesium	Cs	132.81	Phosphorus	P	31.04
Calcium	Ca	40.07	Platinum	Pt	195.2
Carbon	C	12.005	Potassium	K	39.10
Cerium	Ce	140.25	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	93.5	Ruthenium	Ru	101.7
Copper	Cu	63.57	Samarium	Sa	150.4
Dysprosium	Dy	162.5	Scandium	Sc	44.1
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	69.9	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	232.4
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	88.7
Magnesium	Mg	24.32	Zinc	Zn	65.37
Manganese	Mn	54.93	Zirconium	Zr	90.6
Mercury	Hg	200.6			

[1] THIS JOURNAL, **37**, 516.

Ytterbium.—Blumenfeld and Urbain,[1] in a series of analyses of the sulfate $Yb_2(SO_4)_3.8H_2O$, find Yb = 173.54. This may be rounded off to 173.5.

Uranium.—Hönigschmid,[2] from analyses of the bromide UBr_4, finds U = 238.18. The value 238.2 may properly be adopted.

At the meeting of the International Congress of Applied Chemistry, in 1912, a resolution was passed favoring delay in changes in the table of atomic weights. In accordance with the desire so expressed, no changes have since been made, but several now seem to be necessary. These relate to C, S, He, Sn, Pb, Ra, U, Yt, Pr, Yb, Lu, and U. The reasons for the changes, which are small, may be found in this and the three preceding reports. They are based upon new determinations, which seem to be better than the old.

(Signed) F. W. CLARKE,
T. E. THORPE,
W. OSTWALD.

NOTE.—Professor Urbain, because of an official connection with the military service of France, is debarred from signing any international report during the war. Otherwise he would approve this report.

F. W. C.

[CONTRIBUTION FROM THE CHEMICAL LABORATORY OF THE UNIVERSITY OF CALIFORNIA.]

THE VAPOR PRESSURE OF THALLIUM AMALGAMS.

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The work presented in this paper is in continuation of the series of investigations undertaken by one of us on the laws of concentrated solutions. The previous papers include vapor pressure measurements on zinc,[3] silver,[4] gold,[4] and bismuth[4] amalgams, and also a discussion of e. m. f. measurements to be found in the literature on the amalgams of zinc, tin, lead, thallium, indium and cadmium.[1] We would refer to the earlier papers for the progress of the work up to this point, as well as for references to the literature.

The experimental procedure was essentially the same as that used in working with bismuth amalgams, so that it is unnecessary to repeat its description here. The thallium used was analyzed for lead, two experiments giving 0.3% and 0.25%, respectively, an amount of impurity far too small to have any effect on these measurements.

[1] *Compt. rend.*, **159**, 325.

[2] *Z. Electrochem.*, **20**, 452.

[3] J. H. Hildebrand, *Orig. Comm. 8th Intern. Congr. Appl. Chem.*, **22**, 139, 147; *Trans. Am Electrochem. Soc.*, **22**, 319, 335 (1912); THIS JOURNAL, **35**, 501 (1913).

[4] Ermon D. Eastman and J. H. Hildebrand, THIS JOURNAL, **36**, 2020 (1914).