VOL. XXXIV. NOVEMBER, 1912. NO. 11.

THE JOURNAL

OF THE

American Chemical Society

ANNUAL REPORT OF THE INTERNATIONAL COMMITTEE ON ATOMIC WEIGHTS, 1913.

Received October 12, 1912.

Since the annual report for 1912 was prepared a number of important memoirs on atomic weights have appeared. There are also one or two earlier researches which were received too late to be noticed at the proper time. These investigations may be summarized as follows:

Nitrogen.—Wourtzel,[1] by oxidizing NO to N_2O_4, has redetermined the ratio between nitrogen and oxygen. Five concordant measurements give, in mean, N = 14.0068.

Potassium and Chlorine.—Staehler and Meyer[2] have made careful analyses of potassium chlorate, with especial precautions against contamination by the chloride. Their final series gives KCl = 74.5551, whence K = 39.097 and Cl = 35.458. For a discussion of their results, see also Guye,[3] who concludes that the impurity above mentioned was, if not completely, at least sufficiently eliminated to be practically negligible.

Fluorine.—McAdam and Smith[4] have published two preliminary determinations of the atomic weight of fluorine. Sodium fluoride was converted into chloride by heating in dry, gaseous hydrochloric acid, and from the ratios between the weights the atomic weight was calculated. The two values found are F = 19.0176 and 19.0133.

Phosphorus.—From analyses of phosphorus tribromide Baxter, Moore and Boylston[5] find, in mean of three series, P = 31.027 when Ag = 107.88.

[1] *Compt. rend.*, **154**, 115.
[2] *Z. anorg. Chem.*, **71**, 368.
[3] *J. chim. phys.*, **10**, 145.
[4] THIS JOURNAL, **34**, 592.
[5] *Proc. Amer. Acad.*, **47**, 585; THIS JOURNAL, **34**, 259.

This agrees fairly well with the former work of Baxter and Jones on silver phosphate. Further work on phosphorus trichloride is promised.

Mercury.—Easley and Brann,[1] by analyses of mercuric bromide, find Hg = 200.64. This confirms the previous work of Easley on the chloride.

Selenium.—Kuzma and Krehlik[2] have redetermined the atomic weight of selenium by reduction of SeO_2 with SO_2. The mean of ten determinations is Se = 79.26.

Tellurium.—Harcourt and Baker[3] have thrown doubt upon the work of Flint, who claimed to have split up the supposed element into two fractions of different atomic weight. They repeated his method of fractionation, and from the fourth fraction found Te = 127.54. This agrees with the figure found by Baker and Bennett in 1907. Similar fractionations have been carried out also by Pellini[4] who likewise failed to find any indication of a tellurium of low atomic weight.

Radium.—Hönigschmid,[5] by careful analyses of relatively large quantities of radium chloride, finds Ra = 225.95. On the other hand, Gray and Ramsay,[6] using very small quantities of material, and converting the bromide into the chloride, find Ra = 226.36, in agreement with previous work by Madame Curie and Thorpe. Until the discordance between Hönigschmid's low value and the higher is explained, it is undesirable to change the figure given in the table.

Tantalum.—The determinations of this atomic weight by Chapin and Smith[7] were made by the hydrolysis of $TaBr_5$. The mean of eight determinations gave Ta = 181.80, a figure somewhat higher than that found by Balke from similar analyses of the pentachloride.

Iridium.—Hoyermann,[8] by five reductions of $(NH_4)_2IrCl_6$ in hydrogen, finds Ir = 192.613.

Holmium.—Six determinations of the atomic weight of holmium by Holmberg[9] gave Ho = 163.45. The well known sulfate method was employed.

There are also approximate determinations of the atomic weights of lead, zinc and copper by Pecheux,[10] and of calcium by Oechsner de Coninck.[11] The figures obtained are not conclusive enough to justify

[1] THIS JOURNAL, **34**, 137.

[2] *Trans. Bohemian Acad. of Emperor Frances Joseph*, **19**, No. 13, 1910. Data furnished the committee by Professor B. Brauner.

[3] *J. Chem. Soc.*, **99**, 1311.

[4] *Atti Accad. Lincei*, **21**, 218.

[5] *Monatsh. Chem.*, **33**, 253.

[6] *Proc. Roy. Soc.*, (*A*) **86**, 270.

[7] THIS JOURNAL, **33**, 1497.

[8] *Sitzungsb. phys. med. Soz. Erlangen*, **42**, 278.

[9] *Z. anorg. Chem.*, **71**, 226.

[10] *Compt. rend.*, **154**, 1419.

[11] *Ibid.*, **153**, 1579.

their use in the table. for the methods emploved were not of great accuracy.

International Atomic Weights, 1913.

	Symbol.	Atomic weight.		Symbol.	Atomic weight.
Aluminium	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	12.00	Potassium	K	39.10
Cerium	Ce	140.25	Praseodymium	Pr	140.6
Chlorine	Cl	35.46	Radium	Ra	226.4
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	32.07
Glucinum	Gl	9.1	Tantalum	Ta	181.5
Gold	Au	197.2	Tellurium	Te	127.5
Helium	He	3.99	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	119.0
Iridium	Ir	193.1	Titanium	Ti	48.1
Iron	Fe	55.84	Tungsten	W	184.0
Krypton	Kr	82.92	Uranium	U	238.5
Lanthanum	La	139.0	Vanadium	V	51.0
Lead	Pb	207.10	Xenon	Xe	130.2
Lithium	Li	6.94	Ytterbium (Neoytterbium)	Yb	172.0
Lutecium	Lu	174.0	Yttrium	Yt	89.0
Magnesium	Mg	24.32	Zinc	Zn	65.37
Manganese	Mn	54.93	Zirconium	Zr	90.6
Mercury	Hg	200.6			

Only one change is recommended in the table for 1913; namely, the insertion of holmium, for which, hitherto, no good atomic weight determination has been available. Two or three other alterations of small

importance might be made, but it seems undesirable to make changes too frequently.

(Signed) F. W. CLARKE,
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SOME PHYSICAL CONSTANTS OF SULFUR TRIOXIDE. MELTING AND BOILING POINTS, DENSITY, COEFFICIENT OF EXPANSION AND MOLECULAR WEIGHTS.[1]

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Received August 30, 1912.

The existence of two forms of sulfur trioxide, distinguished as the α- and β-forms, has been generally recognized. The same method of distinguishing the two forms will be used in this paper. The former has a definit melting point, while the latter probably does not melt at all under atmospheric pressure, but on being heated changes to vapor, whose condensation gives rise to the α-form, which may later go over into the β-form.

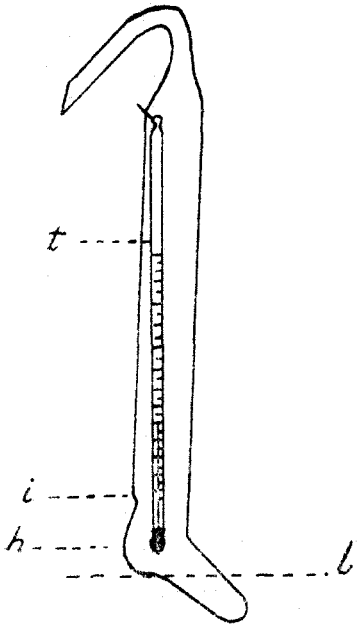

Fig. 1.—First made by Mr. H. P. Eastman, to whom I wish here to acknowledge my indebtedness.

The sulfur trioxide used in this work was prepared by repeated distillation of it, from phosphoric anhydride, in an evacuated and sealed apparatus like that previously described.[2] For the purpose of taking the melting and boiling points, the receiver was given the form shown in Fig. 1. When the trioxide had been quite thoroughly dehydrated, there was distilled enough of it to fill the receiver to the line *l*. Dry air[3] was now slowly admitted to atmospheric pressure, and then the neck of the receiver was bent through considerably more than a right angle and sealed off.

Melting Point and Boiling Point.

On being cooled to 10 or 12°, such a specimen froze to a mass of what looked like parallel lying rods. After slight

[1] Read at the Eighth International Congress of Applied Chemistry, New York, September, 1912.

[2] THIS JOURNAL, **30**, 1835–37.

[3] *Ibid.*, 1837.