XII.—*The Melting and Boiling Points of certain Inorganic Substances.*

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The melting points of the following substances were determined by the specific heat method, which has been previously described by one of us (this Journal, 1876, **1**, 489, and 1878, Trans., 273).

Substance.	M. p.	Mean.	Remarks.
	°	°	
Tellurium ..	438 445 458 479	455	A pure sample obtained from Trommsdorf.
Tellurium	452	452	This specimen was purified by Mr. L. Wills (this Journal, 1879, Trans., 704) by distillation in hydrogen, &c., and was used by him in determining the atomic weight of the element.
$TeCl_2$	201 213 213	209	
$TeCl_4$	—	224 (corr.)	Measured by a thermometer.
$TeBr_2$	—	about 280°	
$TeBr_4$	371 379 389	380	
Cu_2Br_2.....	494 502 515	504	Prepared by dissolving cuprous oxide in hydrobromic acid. A determination of the copper in this specimen agreed with the calculated result.
Rb_2CO_3	830 836 845	837	Prepared by ignition of the acid tartrate.
CsCl	626 632 634	631	From pure cæsium alum.
$NaBrO_3$	379 383	381	
$KClO_4$.....	597 600 618 624	610	
KIO_3	559 561	560	This salt undergoes partial decomposition, iodine being evolved.
KIO_4	570 586 590	582	This salt decrepitates at 389° and melts at 582°.
BiI_3.....	—	below 439°	Decomposes with evolution of iodine; the residue melts at 462°. In sealed capillary tubes the salt melts below 439°.

The following melting points were determined by suddenly plunging sealed capillary tubes containing the salts into a zinc chloride bath at different temperatures, and observing whether fusion took place :—

$BeCl_2$, 585—617° } Prepared by passing chlorine or bromine over a
$BeBr_2$, 585—617 } mixture of charcoal and beryllia.
Fe_2Cl_6, 306—307 Begins to sublime below 100°.
Cr_2Cl_6 decomposes, with liberation of chlorine, but does not melt.

The boiling points of several metallic salts were determined by the method which has been previously described by us in this Journal (1878, Trans., 281, and 1879, Trans., 563). In the following table Column I contains the name of the substance, II, the salts used in measuring the boiling point, the symbol + being used to indicate that the salt melts, and − to show that it has not fused. III gives the melting points of these salts, and IV the boiling point of the substance.

I.	II.	III.	IV.	Remarks.
		°	°	
Cuprous chloride	+ Na_2SO_4 + Ag − Cu	861 954 1032	(954—1032)	From Trommsdorf.
Cuprous bromide	+ Na_2SO_4 − Ag − Cu	861 954 1032	(861—954)	Prepared by passing SO_2 through a solution of $CuSO_4$ and KBr; also by dissolving cuprous oxide in hydrobromic acid. Analysis gave 44·20 per cent. Cu calculated 44·25.
Cuprous iodide	+ KCl + MoO_3 − NaCl − Na_2CO_3	734 759 772 814	(759—772)	Prepared by precipitating $CuSO_4$ with KI, in presence of sulphurous acid. Decomposes with evolution of iodine.
Cadmium bromide	+ $Pb(PO_3)_2$ + $Pb_2P_2O_7$ − $BaBr_2$ − Na_2CO_3	800 806 812 814	(806—812)	Prepared by the action of bromine on cadmium in the presence of alcohol.
Cadmium iodide	+ Li_2CO_3 + NaBr − $CaCl_2$ − KCl	695 708 719 734	(708—719)	Prepared by dissolving metallic cadmium in hydriodic acid.
Lead iodide	Na_2CO_3 Na_2SO_4 − Ag	814 861 954	(861—954)	Prepared by dissolving pure lead in hydriodic acid. Slowly decomposes on boiling with liberation of iodine.
Tellurium bromide	—	—	339	Measured by a thermometer.

The melting points of silver and copper have recently been redeter-

mined by Violle (*Compt. rend.*, Oct. 27th, 1879), and we have made use of his numbers in the preceding experiments.

The adoption of these numbers involves an alteration in our last paper (*Chem. Soc. Trans.*, 1879), viz., the substitution of 861—954° for 861—1000° as the temperature at which lead chloride, cadmium chloride, and metallic sodium boil.

The melting points of four of the above compounds were calculated by the method recently described by one of us (*Proc. Roy. Soc.*, 1879, No. 197). The calculated numbers agree fairly well with the experimental results, as is seen from the following data:—

	Calculated.	Observed.
CsCl	below 959°	904°
Cu_2Br_2 ...	782	777
$BeCl_2$	820—870	858—890
$BeBr_2$	802—820	858—890

In our last communication (*Chem. Soc. Trans.*, 1879, 565) we drew attention to the fact that our determinations of the temperature of the boiling points of antimony, tin, bismuth, and lead differed considerably from the boiling points of these metals as calculated by Wiebe's method (*Ber.*, **12**, 788), and we now find that the observed boiling points of cadmium iodide and lead iodide by no means agree with the temperature calculated by means of Wiebe's formula.

	Calculated.	Observed.
CdI_2	597°	708—719°
PbI_2	547	861—954

In conclusion we may point out a curious fact in connection with the melting and boiling points of the mercuric and cuprous halogen compounds, viz., that in the mercuric compounds the melting point sinks and the boiling point rises with an increased molecular weight, whilst in the cuprous compounds the reverse is the case; the melting point rises and the boiling point falls.

		Chlorides.	Bromides.	Iodides.
Mercuric ..	m. p...	287°	244°	241°
	b. p...	303	319	349
Cuprous ..	m. p...	434	504	601
	b. p...	954	861	760