STUDIES ON THE DEPENDENCE OF OPTICAL ROTATORY POWER ON CHEMICAL CONSTITUTION.

Part XV. Chloroaryl Derivatives of Stereoisomeric Methylenecamphors.

By Bawa Kartar Singh
and
Bhutnath Bhaduri.
(From the Department of Chemistry, Science College, Patna.)

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The object of the paper was to study the effect of substitution of the hydrogen atom by chlorine on the rotatory dispersion of anilinomethylenecamphor. We have, therefore, condensed chloranilines (*o*, *m*, *p*), *2 : 4*-dichloranilines and *2 : 4 : 6*-trichloranilines with oxymethylenecamphor (*d*, *l*, *dl*).

Effect of Chemical Constitution on the Rotatory Power.—The replacement of a hydrogen atom in benzene nucleus by a negative group such as chlorine tends to decrease the electrostatic moment.[1] If it is supposed that there is any relation between electrostatic moment of a compound and its rotatory power, we shall expect that these properties will be affected alike ; a decrease in the electrostatic moment of the compound should result in the decrease of its rotatory power. The experimental results now recorded bear this out. The rotatory power of monochloro-derivatives of anilinomethylenecamphors are lower than those of the parent compound in all the six solvents examined and for all wave-lengths, from $\lambda = 4800$ Å.U. to 6708 Å.U.

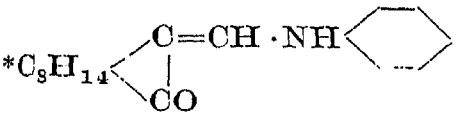
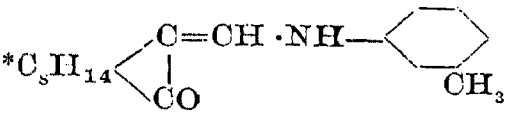
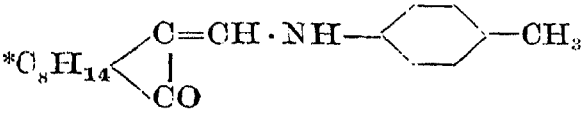
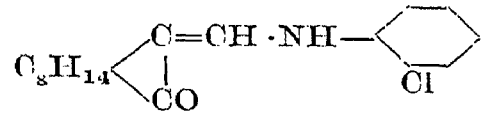
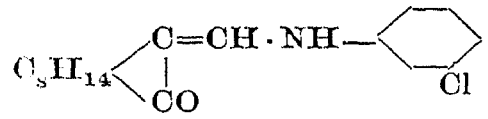
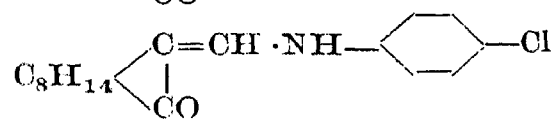
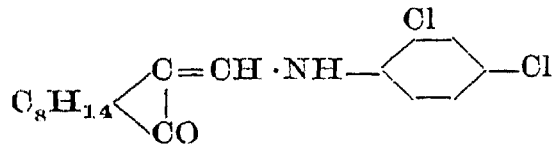
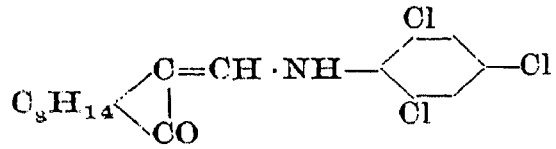
This is further confirmed by the observations with *2 : 4*-dichloro and *2 : 4 : 6*-trichloro derivatives of anilinomethylenecamphors which show progressive diminution in the rotatory power (see Table A).

The chlorophenyl derivatives of aminomethylenecamphors have lower rotatory power than the toluidinomethylenecamphors and the latter have lower rotatory power than that of anilinomethylenecamphors.[2] The sequence of the different substituent groups in the series is, therefore, $H > CH_3 > Cl$ which agrees with the polar series deduced from electronic theory.

Influence of Substituents on Rotatory Power of the Position Isomerides.—The sequence of the rotatory power of the position isomerides (Table A) is *un* > *p* > *o* > *m* in methyl alcohol, ethyl alcohol and pyridine ;

[1] Thomson, *Phil. Mag.*, 46, 497.
[2] Singh, Bhaduri and Barat, *J. Ind. Chem. Soc.*, 1931, 8, 345.

TABLE A.

Structural formulæ	$[\alpha]^{35°}_{Hg_{gr}}$					
	MeOH	EtOH	Acetone	Pyridine	Chloro-form	Benzene
	480·0°	451·3°	448·9°	433.2°	424·6°	367·1°
	454·4	439·9	442·3	405·8	384·8	362·6
	465·0	440·8	425·8	401·6	401·6	355·4
	400·2	405·8	380·0	391·3	386·0	364·7
	388·5	384·7	388·0	374·4	381·4	363·6
	417·7	406·3	401·8	394·4	374·6	359·4
	362·5	369·3	362·3	367·9	366·6	337·9
	259·8	265·2	258·7	250·8	255·0	219·1

* Singh, Bhaduri and Barat, *loc. cit.*

un > *o* > *m* > *p* in chloroform and benzene and *un* > *p* > *m* > *o* in acetone. This is neither in agreement with Frankland's lever arm hypothesis[3] nor with the electrostatic modification as suggested by Rule,[4] as the *unsubstituted* compound has always the highest rotatory power in all these cases. This point has already been emphasised in previous communications.[5]

[3] *J. Chem. Soc.*, 1896, **69**, 1583.

[4] *J. Chem. Soc.*, 1924, **125**, 1122.

[5] Singh, Mallik and Bhaduri, *J. Ind. Chem. Soc.*, 1931, **8**, 95; Singh, Bhaduri and Barat, *loc. cit.*

Nature of Solvents and the Rotatory Power.—The compounds studied in the present paper have, in general, highest rotations in alcohol (ethyl and methyl) and lowest as a rule, in benzene. For other solvents no fixed sequence is observed. This is in agreement with the sequence of the dielectric constants of the solvents; the positions of chloroform, acetone and pyridine are however frequently interchanged (*vide* Tables I–XXX).

The Nature of Rotatory Dispersion.—The rotatory dispersion is found, as with the other compounds of the series,[6] to obey the simple dispersion law, $[\alpha] = \frac{k}{\lambda^2 - \lambda_0^2}$. In the numerical test given in the tables of rotatory dispersion (I–XXX), this point is clearly brought out as the differences in the observed and calculated values of rotatory power lie well within the range of experimental error.

Physical Identity of Isomers.—The values of rotatory power of *d* and *l* forms in different solvents (Tables I–XXX) are identical within limits of experimental errors. Out of 258 observations now recorded, in as many as 231 cases the difference in the numerical value of specific rotatory power of the opposite isomers corresponds to a difference of less than 0·01° in the observed angle of rotation and in 23 other cases the corresponding angle lies between 0·01°–0·02° which is the limit of experimental error allowable in such measurements. Only in the remaining 4 cases, *viz.*, *m*-chloranilinomethylenecamphor in acetone for Ag_{5209} (Table IX) and in pyridine for Cd_{5086} (Table X); *2 : 4*-dichloranilinomethylenecamphor in ethyl alcohol for Cd_{4800} (Table XXIII); and *2 : 4 : 6*-trichloranilinomethylenecamphor in methyl alcohol (Table XXX) the difference corresponds to between 0·02° and 0·03° in the observed angle of rotation. All these are, however, of the nature of casual experimental errors. This therefore further supports Pasteur's principle of molecular dissymmetry, according to which the two forms, *dextro* and *lævo*, must possess equal and opposite rotatory power.

The melting point of the *racemic* form of *2 : 4*-dichloranilinomethylenecamphor is higher than those of the optically active forms. This form is a true *dl* compound, at least in the solid state.

Experimental.

General Method of Preparation.—The solution of the free base (1 mol. proportion) in *glacial* acetic acid is added to a solution of *oxymethylene-d-camphor* (1 mol. proportion) in methyl alcohol, when a precipitate usually

[6] Singh and Bhaduri, *J. Ind. Chem. Soc.*, 1930, **7**, 771; 1931, **8**, 181; Singh, Bhaduri and Barat, *loc. cit.*

separates at once ; if not, it is left overnight to crystallise slowly (*without* any addition of water). It is then repeatedly crystallised out of suitable solvents, usually methyl alcohol.

The *lævo* and the *racemic* compounds described in the present paper were prepared in the same way as the corresponding *dextro* isomers and have the same crystalline form and similar solubility.

o-*Chloranilinomethylene*-d-*camphor*, faintly yellowish, almost white prismatic needles, m.p. 103°–04°. (Found : C, 70·28 ; H, 6·98 ; $C_{17}H_{20}ClON$ requires C, 70·45 ; H, 6·92 and N, 4·83 per cent.) It is very soluble in pyridine, chloroform, acetone and benzene ; less so in ethyl alcohol and methyl alcohol. The *l*-form, m.p. 103°–04°. (Found : N, 4·86). The *dl*-form m.p. 92°–93° (Found : N, 4·86).

m-*Chloranilinomethylene*-d-*camphor*, long rectangular white plates, m.p. 118°–19°. (Found : C, 70·32 ; H, 6·99 ; $C_{17}H_{20}ClON$ requires C, 70·45 ; H, 6·92 ; and N, 4·83 per cent.) It is very easily soluble in chloroform, pyridine, acetone and benzene ; difficultly in ethyl alcohol and methyl alcohol. The *l*-form, m.p. 118°–19°. (Found : N, 4·96). The *dl*-form m.p. 114°–15°. (Found : N, 4·87).

p-*Chloranilinomethylene*-d-*camphor*, shining long rectangular white plates, m.p. 186°–87°. (Found : C, 70·32 ; H, 7·26 ; $C_{17}H_{20}ClON$ requires C, 70·45 ; H, 6·92 and N, 4·83 per cent.) It is very easily soluble in chloroform, acetone and pyridine ; less so in ethyl alcohol and methyl alcohol ; and difficultly soluble in benzene and ether. The *l*-form, m.p. 186°–87°. (Found : N, 4·84). The *dl*-form, m.p. 185°–87°. (Found : N, 4·96).

2 : 4. *Dichloranilinomethylene*-d-*camphor*, long white silky needles, m.p. 122°–23°. (Found : C, 62·90 ; H, 6·01 ; $C_{17}H_{19}Cl_2NO$ requires C, 62·98 ; H, 5·86 and N, 4·32 per cent.) It is very easily soluble in chloroform, acetone, pyridine, benzene, and ethyl alcohol ; less so in methyl alcohol. The *l*-form m.p., 122°–23°. (Found : N, 4·36). The *dl*-form m.p., 126°–27°. (Found : N, 4·36).

2 : 4 : 6. *Trichloranilinomethylene*-d-*camphor*, shining white prismatic needles, m.p. 108°-09°. (Found : C, 56·78 ; H, 5·05 ; $C_{17}H_{18}Cl_3NO$ requires C, 56·90 ; H, 5·02 and N, 3·90 per cent.) It is very soluble in pyridine, chloroform, benzene and acetone ; less so in ethyl alcohol and methyl alcohol. The *l*-form, m.p. 108°-09°. (Found : N, 4·10). The *dl*-form, m.p. 107°-08°. (Found : N, 3·96).

The rotatory power determinations were made in a 2-dcm. jacketed tube at 35°. The value of λ_0, calculated from the dispersion formula, is given in the tables and is expressed as μ or 10^{-4} cm.

TABLE I. *o-Chloranilinomethylenecamphor in chloroform.*

$$[\alpha] = \pm \frac{61 \cdot 79}{\lambda^2 - 0 \cdot 1382}; \quad \lambda_0 = 0 \cdot 3717.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4004	+669·4°	−0·8°	Cd_{4800}	±670·2°	−0·3°	−669·9°	0·4024
,,	513·2	+0·4	Cd_{5086}	512·8	+0·5	513·3	,,
,,	464·6	+0·5	Ag_{5209}	464·1	−0·6	463·5	,,
,,	386·0	−0·2	Hg_{5461}	386·2	+0·4	386·6	,,
,,	314·8	−0·7	Hg_{5780}	315·5	+0·1	315·6	,,
,,	294·7	−0·8	Na_{5893}	295·5	−0·9	294·6	,,
,,	264·7	+1·1	Li_{6104}	263·6	−0·1	263·5	,,
,,	223·6	−0·1	Cd_{6438}	223·7	+0·1	223·8	,,
,,	198·5	+0·3	Li_{6708}	198·2	+0·6	198·8	,,

The solution did not exhibit mutarotation.

TABLE II. *o-Chloranilinomethylenecamphor in pyridine.*

$$[\alpha] = \pm \frac{63 \cdot 72}{\lambda^2 - 0 \cdot 1352}; \quad \lambda_0 = 0 \cdot 3691.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4000	+515·0°	−0·9°	Cd_{5086}	±515·9°	+0·2°	−516·1°	0·4040
,,	468·8	+0·6	Ag_{5209}	468·2	−0·5	467·7	,,
,,	391·3	+0·4	Hg_{5461}	390·9	+0·2	391·1	,,
,,	320·0	−0·4	Hg_{5780}	320·4	+0·2	320·6	,,
,,	301·3	+0·9	Na_{5893}	300·4	−0·9	299·5	,,
,,	268·8	+0·3	Li_{6104}	268·5	+0·1	268·6	,,
,,	227·5	−0·6	Cd_{6438}	228·1	−0·3	227·8	,,
,,	202·5	+0·1	Li_{6708}	202·4	−0·6	201·8	,,

The solution did not exhibit mutarotation.

TABLE III. *o-Chloranilinomethylenecamphor in benzene.*

$$[\alpha] = \pm \frac{57{\cdot}76}{\lambda^2 - 0{\cdot}1462}\,;\ \lambda_0 = 0{\cdot}3824.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4004	+487·1°	−0·2°	Cd_{5086}	±487·3°	+0·1°	−487·4°	0·4032
,,	442·0	+1·4	Ag_{5209}	440·6	−0·2	440·4	,,
,,	364·7	−0·9	Hg_{5461}	365·6	+0·2	365·8	,,
,,	297·2	−0·7	Hg_{5780}	297·9	−0·3	297·6	,,
,,	279·7	+0·8	Na_{5839}	278·9	+0·1	279·0	,,
,,	248·5	±0	Li_{6104}	248·5	+0·8	249·3	,,
,,	211·0	+0·5	Cd_{6438}	210·5	−0·9	209·6	,,
,,	186·1	−0·3	Li_{6708}	186·4	+0·4	186·0	,,

The solution did not exhibit mutarotation.

TABLE IV. *o-Chloranilinomethylenecamphor in acetone.*

$$[\alpha] = \pm \frac{61{\cdot}42}{\lambda^2 - 0{\cdot}1368}\,;\ \lambda_0 = 0{\cdot}3699.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4000	+655·0°	−1·1°	Cd_{4800}	±656·1°	..	..	0·4020
,,	503·8	−0·1	Cd_{5086}	503·9	+0·4°	−504·3°	,,
,,	457·5	+0·9	Ag_{5209}	456·6	−0·8	455·8	,,
,,	380·0	−0·6	Hg_{5461}	380·6	+0·3	380·9	,,
,,	310·0	−1·3	Hg_{5780}	311·3	−0·1	311·2	,,
,,	292·5	+0·7	Na_{5893}	291·8	+0·8	292·6	,,
,,	260·0	−0·4	Li_{6104}	260·4	−0·1	260·3	,,
,,	221·3	+0·1	Cd_{6438}	221·2	+0·4	221·6	,,
,,	197·5	+1·4	Li_{6708}	196·1	−0·6	195·5	,,

The solution did not exhibit mutarotation.

TABLE V. o-*Chloranilinomethylenecamphor in methyl alcohol.*

$$[\alpha] = \pm \frac{64 \cdot 77}{\lambda^2 - 0 \cdot 1361}; \quad \lambda_0 = 0 \cdot 3689.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4024	+687·2°	+0·3°	Cd_{4800}	±686·9°	+0·6°	−687·5°	0·4000
,,	526·9	−1·4	Cd_{5086}	528·3	−0·8	527·5	,,
,,	479·7	+0·7	Ag_{5209}	479·0	+1·0	480·0	,,
,,	400·2	+0·6	Hg_{5461}	399·6	+1·6	401·2	,,
,,	326·9	−0·2	Hg_{5780}	327·1	−0·8	326·3	,,
,,	308·2	+0·3	Na_{5893}	306·7	+0·8	307·5	,,
,,	273·3	−0·6	Li_{6104}	273·9	−0·1	273·8	,,
,,	233·6	+0·9	Cd_{6438}	232·7	−0·2	232·5	,,
,,	206·3	−0·1	Li_{6708}	206·4	+1·1	207·5	,,

The solution did not exhibit mutarotation.

TABLE VI. o-*Chloranilinomethylenecamphor in ethyl alcohol.*

$$[\alpha] = \pm \frac{72 \cdot 23}{\lambda^2 - 0 \cdot 1203}; \quad \lambda_0 = 0 \cdot 3468.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4016	+654·9°	−1·1°	Cd_{4800}	±656·0°	−1·0°	−655·0°	0·4000
,,	522·9	+1·0	Cd_{5086}	521·9	+0·6	522·5	,,
,,	478·1	−0·2	Ag_{5209}	478·3	−0·8	477·5	,,
,,	405·8	−0·3	Hg_{5461}	406·1	+0·2	406·3	,,
,,	338·1	+0·3	Hg_{5780}	337·8	−0·3	337·5	,,
,,	318·7	+0·5	Na_{5893}	318·2	+0·6	318·8	,,
,,	286·3	±0	Li_{6104}	286·3	+1·2	287·5	,,
,,	245·2	−0·3	Cd_{6438}	245·5	−0·5	245·0	,,
,,	219·1	±0	Li_{6708}	219·1	−0·3	218·8	,,

The solution did not exhibit mutarotation.

TABLE VII. m-*Chloranilinomethylenecamphor in ethyl [illegible]*

$$[\alpha] = \pm \frac{61{\cdot}22}{\lambda^2 - 0{\cdot}1372}; \quad \lambda_0 = 0{\cdot}3704.$$

Dextro			Line	*Levo*			
Concentration g./100 c.c.	Obs. [α] o	$o-c$		Calc. [α] c	$o'-c$	Obs. [illegible]	[illegible]
0·4024	+657·4°	+0·5°	Cd_{4800}	=656·9°	−1·2°	−[illegible]	[illegible]
,,	503·4	−0·5	Cd_{5086}	503·9	−1·3	[illegible]	[illegible]
,,	456·1	−0·5	Ag_{5209}	456·6	=0	[illegible]	[illegible]
,,	381·4	+1·1	Hg_{5461}	380·3	−0·4	[illegible]	[illegible]
,,	311·8	+0·8	Hg_{5780}	311·0	=0	[illegible]	[illegible]
,,	291·0	−0·4	Na_{5893}	291·4	−0·3	[illegible]	[illegible]
,,	259·8	−0·3	Li_{6104}	260·1	−1·3	[illegible]	[illegible]
,,	221·2	+0·4	Cd_{6438}	220·8	−0·3	[illegible]	[illegible]
,,	195·2	−0·6	Li_{6708}	195·8	−0·6	[illegible]	[illegible]

The solution did not exhibit mutarotation but turned light pink on keeping.

TABLE VIII. m-*Chloranilinomethylenecamphor in ethyl [illegible]*

$$[\alpha] = \pm \frac{62{\cdot}47}{\lambda^2 - 0{\cdot}1354}; \quad \lambda_0 = 0{\cdot}3680.$$

Dextro			Line	*Levo*			
Concentration g./100 c.c.	Obs. [α] o	$o-c$		Calc. [α] c	$o'-c$	Obs. [illegible]	[illegible]
0·4028	+658·1°	+0·4°	Cd_{4800}	=657·7°	−0·2°	−[illegible]	[illegible]
,,	505·4	−1·2	Cd_{5086}	506·6	−1·1	[illegible]	[illegible]
,,	459·3	−0·4	Ag_{5209}	459·7	−0·3	[illegible]	[illegible]
,,	384·7	+1·0	Hg_{5461}	383·7	−0·1	[illegible]	[illegible]
,,	315·2	+0·8	Hg_{5780}	314·4	−0·6	[illegible]	[illegible]
,,	294·3	−0·5	Na_{5893}	294·8	−1·0	[illegible]	[illegible]
,,	263·2	−0·2	Li_{6104}	263·4	−0·4	[illegible]	[illegible]
,,	224·8	+1·0	Cd_{6438}	223·8	−1·3	[illegible]	[illegible]
,,	198·6	±0	Li_{6708}	198·6	−0·2	[illegible]	[illegible]

The solution did not exhibit mutarotation.

TABLE IX. m-*Chloranilinomethylenecamphor in acetone.*

$$[\alpha] = \pm \frac{63 \cdot 65}{\lambda^2 - 0 \cdot 1341}; \quad \lambda_0 = 0 \cdot 3662.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4008	+660·0°	−1·0°	Cd_{4800}	±661·0°	..	..	0·4040
,,	511·4	+0·7	Cd_{5086}	510·7	−0·8°	−509·9°	,,
,,	462·7	−1·2	Ag_{5209}	463·9	+1·3	465·2	,,
,,	388·0	+0·1	Hg_{5461}	387·9	−0·2	387·7	,,
,,	318·1	−0·2	Hg_{5780}	318·3	+0·9	319·2	,,
,,	298·2	−0·3	Na_{5893}	298·5	−0·2	298·3	,,
,,	266·9	±0	Li_{6104}	266·9	+0·4	267·3	,,
,,	227·0	±0	Cd_{6438}	227·0	−0·5	226·5	,,
,,	202·0	+0·5	Li_{6708}	201·5	+0·2	201·7	,,

The solution did not exhibit mutarotation.

TABLE X. m-*Chloranilinomethylenecamphor in pyridine.*

$$[\alpha] = \pm \frac{63 \cdot 70}{\lambda^2 - 0 \cdot 1275}; \quad \lambda_0 = 0 \cdot 3571.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4020	+618·4°	−0·6°	Cd_{4800}	±619·0°	+1·1°	−620·1°	0·4040
,,	486·5	+1·0	Cd_{5086}	485·5	−1·5	484·0	,,
,,	442·7	−0·2	Ag_{5209}	442·9	−1·0	441·9	,,
,,	374·4	+1·2	Hg_{5461}	373·2	+0·5	373·7	,,
,,	308·5	+0·2	Hg_{5780}	308·3	−0·1	308·2	,,
,,	289·8	±0	Na_{5893}	289·8	+1·1	290·9	,,
,,	258·8	−1·0	Li_{6104}	259·8	−1·1	258·7	,,
,,	222·7	+0·8	Cd_{6438}	221·9	+0·9	222·8	,,
,,	196·6	−0·9	Li_{6708}	197·5	−0·7	196·8	,,

The solution did not exhibit mutarotation.

TABLE XI. m-*Chloranilinomethylenecamphor in methyl alcohol.*

$$[\alpha] = \pm \frac{63 \cdot 14}{\lambda^2 - 0 \cdot 1361}\,; \quad \lambda_0 = 0 \cdot 3689.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4040	+670·9°	+1·3°	Cd_{4800}	±669·6°	..	..	0·4000
,,	516·1	+1·1	Cd_{5086}	515·0	+1·2°	−516·2°	,,
,,	466·6	−0·4	Ag_{5209}	467·0	−0·7	466·3	,,
,,	388·5	−1·0	Hg_{5461}	389·5	+0·5	390·0	,,
,,	319·3	+0·4	Hg_{5780}	318·9	−0·1	318·8	,,
,,	298·2	−0·8	Na_{5893}	299·0	−0·2	298·8	,,
,,	267·2	+0·2	Li_{6104}	267·0	+0·5	267·5	,,
,,	226·4	−0·4	Cd_{6438}	226·8	−0·5	226·3	,,
,,	200·6	−0·6	Li_{6708}	201·2	+0·1	201·3	,,

The solution did not exhibit mutarotation.

TABLE XII. m-*Chloranilinomethylenecamphor in benzene.*

$$[\alpha] = \pm \frac{60 \cdot 73}{\lambda^2 - 0 \cdot 1311}\,; \quad \lambda_0 = 0 \cdot 3621.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·3988	+476·4°	+1·5°	Cd_{5086}	±474·9°	+1·4°	−476·3°	0·4000
,,	432·5	−0·7	Ag_{5209}	433·2	−0·7	432·5	,,
,,	363·6	+0·2	Hg_{5461}	363·4	+0·4	363·8	,,
,,	299·6	+0·4	Hg_{5780}	299·2	−0·4	298·8	,,
,,	280·8	−0·1	Na_{5893}	280·9	+0·4	281·3	,,
,,	250·6	−0·9	Li_{6104}	251·5	−0·2	251·3	,,
,,	214·3	±0	Cd_{6438}	214·3	+0·7	215·0	,,
,,	190·5	±0	Li_{6708}	190·5	−0·5	190·0	,,

The solution did not exhibit mutarotation.

TABLE XIII. p-*Chloranilinomethylenecamphor in chloroform.*

$$[\alpha] = \pm \frac{67 \cdot 56}{\lambda^2 - 0 \cdot 1176}\ ;\ \lambda_0 = 0 \cdot 3429.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4004	+598·1°	−0·9°	Cd_{4800}	±599·0°	..	..	0·4000
,,	479·5	+0·6	Cd_{5086}	478·9	+1·1°	−480·0°	,,
,,	439·5	−0·3	Ag_{5209}	439·8	+1·1	440·0	,,
,,	374·6	+0·5	Hg_{5461}	374·1	−0·3	373·8	,,
,,	312·2	+0·2	Hg_{5780}	312·0	+0·5	312·5	,,
,,	293·6	−0·5	Na_{5893}	294·1	−0·3	293·8	,,
,,	266·0	+1·0	Li_{6104}	265·0	±0	265·0	,,
,,	227·3	−0·3	Cd_{6438}	227·6	+1·2	228·8	,,
,,	202·3	−0·9	Li_{6708}	203·2	−0·7	202·5	,,

The solution exhibited slight mutarotation ; the initial values $[\alpha]_{Hg_{gr}} = 374 \cdot 6°$ and $[\alpha]_{Hg_y} = 312 \cdot 2°$ changing to 363·4° and 303·5° respectively in course of 18 hours, the solution turning light yellow on keeping.

TABLE XIV. p-*Chloranilinomethylenecamphor in benzene.*

$$[\alpha] = \pm \frac{57 \cdot 80}{\lambda^2 - 0 \cdot 1375}\ ;\ \lambda_0 = 0 \cdot 3708.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4008	+476·6°	−0·3°	Cd_{5086}	±476·9°	+1·8°	−478·7°	0·4000
,,	432·1	+0·2	Ag_{5209}	431·9	−0·4	431·5	,,
,,	359·4	−0·3	Hg_{5461}	359·7	+1·6	361·3	,,
,,	294·4	+0·4	Hg_{5780}	294·0	−1·5	292·5	,,
,,	275·7	+0·3	Na_{5893}	275·4	−0·4	275·0	,,
,,	245·8	±0	Li_{6104}	245·8	−0·8	245·0	,,
,,	208·4	−0·2	Cd_{6438}	208·6	−1·1	207·5	,,
,,	184·7	−0·3	Li_{6708}	185·0	±0	185·0	,,

The solution exhibited slight mutarotation ; the initial value $[\alpha]_{Hg_{gr}} = 359 \cdot 4°$ and $[\alpha]_{Hg_y} = 294 \cdot 4°$ changing to 349·4° and 284·4° respectively in course of 24 hours.

TABLE XV. p-*Chloranilinomethylenecamphor in acetone.*

$$[\alpha] = \pm \frac{70 \cdot 58}{\lambda^2 - 0 \cdot 1228}\,; \quad \lambda_0 = 0 \cdot 3504.$$

Dextro			Line	Calc. [α] *c*	*Lævo*		
Concentration g./100 c.c.	Obs. [α] *o*	*o*–*c*			*o′*–*c*	Obs. [α] *o′*	Concentration g./100 c.c.
0·4020	+518·7°	−0·7°	Cd_{5086}	±519·4°	+0·6°	−520·0°	0·4000
,,	476·4	+1·2	Ag_{5209}	475·2	+1·1	476·3	,,
,,	401·8	−0·6	Hg_{5461}	402·4	−1·1	401·3	,,
,,	334·7	+0·7	Hg_{5780}	334·0	+1·0	335·0	,,
,,	313·4	−1·0	Na_{5893}	314·4	−0·6	313·8	,,
,,	282·3	−0·3	Li_{6104}	282·6	−0·1	282·5	,,
,,	242·5	+0·5	Cd_{6438}	242·0	+0·5	242·5	,,
,,	216·4	+0·7	Li_{6708}	215·7	−0·7	215·0	,,

The solution did not exhibit mutarotation.

TABLE XVI. p-*Chloranilinomethylenecamphor in ethyl alcohol.*

$$[\alpha] = \pm \frac{73 \cdot 20}{\lambda^2 - 0 \cdot 1180}\,; \quad \lambda_0 = 0 \cdot 3435.$$

Dextro			Line	Calc. [α] *c*	*Lævo*		
Concentration g./100 c.c.	Obs. [α] *o*	*o*–*c*			*o′*–*c*	Obs. [α] *o′*	Concentration g./100 c.c.
0·4000	+650·0°	−1·2°	Cd_{4800}	±651·2°	−0·7°	−650·5°	0·4028
,,	518·8	−1·4	Cd_{5086}	520·2	−0·1	520·1	,,
,,	478·8	+1·3	Ag_{5209}	477·5	+1·0	478·5	,,
,,	406·3	+0·1	Hg_{5461}	406·2	−0·2	406·0	,,
,,	338·8	+0·1	Hg_{5780}	338·7	+0·2	338·7	,,
,,	318·8	−0·4	Na_{5892}	319·2	−0·4	318·8	,,
,,	287·5	±0	Li_{6104}	287·5	+0·5	288·0	,,
,,	246·3	−0·6	Cd_{6438}	246·9	−1·1	245·8	,,
,,	221·3	+0·8	Li_{6708}	220·5	+0·5	221·0	,,

The solution did not exhibit mutarotation.

TABLE XVII. p-*Chloranilinomethylenecamphor in pyridine.*

$$[\alpha] = \pm \frac{68 \cdot 19}{\lambda^2 - 0 \cdot 1251}; \quad \lambda_0 = 0 \cdot 3537.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4028	+645·8°	−1·8°	Cd_{4800}	±647·6	..	..	0·4004
,,	510·5	+0·1	Cd_{5086}	510·4	−0·8°	−509·6°	,,
,,	465·7	−0·7	Ag_{5209}	466·4	−0·6	465·8	,,
,,	394·4	+0·5	Hg_{5461}	393·9	+0·8	394·7	,,
,,	326·7	+0·5	Hg_{5780}	326·2	−0·2	326·0	,,
,,	306·6	−0·3	Na_{5892}	306·9	+0·3	307·2	,,
,,	275·8	+0·3	Li_{6104}	275·5	−0·8	274·7	,,
,,	234·7	−0·9	Cd_{6438}	235·6	+0·4	236·0	,,
,,	209·8	±0	Li_{6708}	209·8	±0	209·8	,,

The solution did not exhibit mutarotation.

TABLE XVIII. p-*Chloranilinomethylenecamphor in methyl alcohol.*

$$[\alpha] = \pm \frac{75 \cdot 34}{\lambda^2 - 0 \cdot 1178}; \quad \lambda_0 = 0 \cdot 3432.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4012	+668·0°	−1·1°	Cd_{4800}	+669·1°	..	..	0·4040
,,	534·6	−0·1	Cd_{5086}	534·7	+1·2°	−535·9°	,,
,,	492·3	+1·5	Ag_{5209}	490·8	−0·7	490·1	,,
,,	417·7	±0	Hg_{5461}	417·7	+0·3	418·0	,,
,,	347·7	−0·5	Hg_{5780}	348·2	−0·1	348·1	,,
,,	327·9	−0·4	Na_{5892}	328·3	+0·9	329·2	,,
,,	296·6	+1·0	Li_{6104}	295·6	+1·4	297·0	,,
,,	254·2	+0·2	Cd_{6438}	254·0	+1·0	255·0	,,
,,	226·8	±0	Li_{6708}	226·8	−0·3	226·5	,,

The solution did not exhibit mutarotation.

TABLE XIX. 2 : 4-*Dichloranilinomethylenecamphor in acetone.*

$$[\alpha] = \pm \frac{58 \cdot 84}{\lambda^2 - 0 \cdot 1353}; \quad \lambda_0 = 0 \cdot 3678.$$

Dextro			Line	Calc. [α] *c*	*Lævo*		
Concentration g./100 c.c.	Obs. [α] *o*	*o*–*c*			*o'*–*c*	Obs. [α] *o'*	Concentration g./100 c.c.
0·4016	+617·4°	−1·3°	Cd_{4800}	±618·7°	..	..	0·4040
,,	476·9	±0	Cd_{5086}	476·9	+0·9°	−477·8°	,,
,,	432·0	−0·7	Ag_{5209}	432·7	−2·0	430·7	,,
,,	362·3	+1·1	Hg_{5461}	361·2	+0·2	361·4	,,
,,	296·4	+0·3	Hg_{5780}	296·1	+0·9	297·0	,,
,,	277·7	±0	Na_{5893}	277·7	−0·2	277·5	,,
,,	248·9	+0·9	Li_{6104}	248·0	+0·8	248·8	,,
,,	210·5	−0·2	Cd_{6438}	210·7	−1·5	209·2	,,
,,	188·0	+0·9	Li_{6708}	187·1	−0·2	186·9	,,

The solution did not exhibit mutarotation.

TABLE XX. 2 : 4-*Dichloranilinomethylenecamphor in chloroform.*

$$[\alpha] = \pm \frac{58 \cdot 84}{\lambda^2 - 0 \cdot 1380}; \quad \lambda_0 = 0 \cdot 3715.$$

Dextro			Line	Calc. [α] *c*	*Lævo*		
Concentration g./100 c.c.	Obs. [α] *o*	*o*–*c*			*o'*–*c*	Obs. [α] *o'*	Concentration g./100 c.c.
0·4024	+489·6°	+2·1°	Cd_{5086}	± 487·5°	+1·3°	−488·8°	0·4000
,,	441·2	−0·3	Ag_{5209}	441·5	+1·0	442·5	,,
,,	366·6	−0·8	Hg_{5461}	367·4	−1·1	366·3	,,
,,	300·8	+0·7	Hg_{5780}	300·1	−0·1	300·0	,,
,,	282·1	+0·9	Na_{5893}	281·2	−0·2	280·0	,,
,,	249·8	−1·0	Li_{6104}	250·8	+0·5	251·3	,,
,,	212·5	−0·3	Cd_{6438}	212·8	−0·3	212·5	,,
,,	188·8	+0·3	Li_{6708}	188·6	+0·2	188·8	,,

The solution did not exhibit mutarotation.

TABLE XXI. 2 : 4-*Dichloranilinomethylenecamphor in pyridine.*

$$[\alpha] = \pm \frac{58 \cdot 84}{\lambda^2 - 0 \cdot 1380}\,; \quad \lambda_0 = 0 \cdot 3715.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4024	+635·1°	−1·7°	Cd_{4800}	±636·8°	+0·7°	−637·5°	0·4000
,,	488·4	+0·9	Cd_{5086}	487·5	±0	487·5	,,
,,	441·2	−0·3	Ag_{5209}	441·5	−1·5	440·0	,,
,,	367·9	+0·5	Hg_{5461}	367·4	−1·1	366·3	,,
,,	300·7	+0·6	Hg_{5780}	300·1	+1·1	301·2	,,
,,	280·9	−0·3	Na_{5893}	281·2	±0	281·2	,,
,,	251·1	+0·3	Li_{6104}	250·8	+0·4	251·2	,,
,,	212·5	−0·3	Cd_{6438}	212·8	−1·5	211·3	,,
,,	188·9	+0·3	Li_{6708}	188·6	+0·2	188·8	,,

The dispersion formula is the same as that of the chloroform solution. The solution did not exhibit mutarotation.

TABLE XXII. 2 : 4-*Dichloranilinomethylenecamphor in benzene.*

$$[\alpha] = \pm \frac{53 \cdot 14}{\lambda^2 - 0 \cdot 1407}\,; \quad \lambda_0 = 0 \cdot 3751.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4040	+449·5°	−0·8°	Cd_{5086}	±450·3°	+0·4°	−450·7°	0·4016
,,	408·4	+1·3	Ag_{5209}	407·1	+0·1	407·2	,,
,,	337·9	+0·5	Hg_{5461}	337·4	±0	337·4	,,
,,	273·6	−1·1	Hg_{5780}	274·7	−2·0	272·7	,,
,,	257·4	+0·1	Na_{5893}	257·3	−0·8	256·5	,,
,,	228·9	−0·2	Li_{6104}	229·1	±0	229·1	,,
,,	194·3	+0·2	Cd_{6438}	194·1	+0·1	194·2	,,
,,	172·0	+0·2	Li_{6708}	171·8	±0	171·8	,,

The solution did not exhibit mutarotation.

TABLE XXIII. 2 : 4-*Dichloranilinomethylenecamphor in ethyl alchol.*

$$[\alpha] = + \frac{59 \cdot 55}{\lambda^2 - 0 \cdot 1373}; \quad \lambda_0 = 0 \cdot 3705.$$

Dextro					*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$	Line	Calc. $[\alpha]$ c	$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·1018	+637·5°	2·1°	Cd_{4800}	+639·6°	+0·5°	−640·1°	0·4024
,,	491·5	+0·9	Cd_{5086}	490·6	−0·9	489·7	,,
,,	445·8	+1·3	Ag_{5209}	444·5	+1·7	446·2	,,
,,	369·3	−0·9	Hg_{5461}	370·2	−1·0	369·2	,,
,,	302·6	−0·4	Hg_{5780}	302·6	−0·6	302·0	,,
,,	284·1	+0·4	Na_{5893}	283·7	+0·8	284·5	,,
,,	253·2	+0·1	Li_{6104}	253·1	+0·4	253·5	,,
,,	213·7	−1·1	Cd_{6438}	214·8	−1·0	213·8	,,
,,	189·5	−1·0	Li_{6708}	190·5	−0·4	190·1	,,

The solution did not exhibit mutarotation.

TABLE XXIV. 2 : 4-*Dichloranilinomethylenecamphor in methyl alchol.*

$$[\alpha] = + \frac{56 \cdot 09}{\lambda^2 - 0 \cdot 1432}; \quad \lambda_0 = 0 \cdot 3784.$$

Dextro					*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$	Line	Calc. $[\alpha]$ c	$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·1000	+485·0°	0·5°	Cd_{5086}	+485·5°	−0·3°	−485·2°	0·4040
,,	438·7	+0·8	Ag_{5209}	437·9	+0·2	438·1	,,
,,	362·5	+0·6	Hg_{5461}	361·9	+0·8	362·7	,,
,,	292·5	−1·3	Hg_{5780}	293·8	−0·4	293·4	,,
,,	273·8	−1·1	Na_{5893}	274·9	−0·1	274·8	,,
,,	245·0	+0·5	Li_{6104}	244·5	+0·6	245·1	,,
,,	207·5	+0·7	Cd_{6438}	206·8	−0·2	206·6	,,
,,	182·5	−0·3	Li_{6708}	182·8	+0·4	183·2	,,

The solution did not exhibit mutarotation.

TABLE XXV. 2 : 4 : 6-*Trichloranilinomethylenecamphor in acetone.*

$$[\alpha] = \pm \frac{43 \cdot 39}{\lambda^2 - 0 \cdot 1297}; \quad \lambda_0 = 0 \cdot 3601.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4020	+430·3°	−0·6°	Cd_{4800}	±430·9°	−0·9°	−430·0°	0·4000
,,	337·2	+0·8	Cd_{5086}	336·4	−0·1	336·3	,,
,,	306·0	−0·4	Ag_{5209}	306·4	+1·1	307·5	,,
,,	258·7	+1·2	Hg_{5461}	257·5	±0	257·5	,,
,,	211·5	−0·8	Hg_{5780}	212·3	−1·0	211·3	,,
,,	200·3	+0·9	Na_{5893}	199·4	+1·8	201·2	,,
,,	179·1	+0·4	Li_{6104}	178·7	+0·1	178·8	,,
,,	151·8	−0·5	Cd_{6438}	152·3	−1·0	151·3	,,
,,	135·6	+0·1	Li_{6708}	135·5	+0·8	136·3	,,

The solution did not exhibit mutarotation.

Table XXVI. 2 : 4 : 6-*Trichloranilinomethylenecamphor in chlorofrom.*

$$[\alpha] = \pm \frac{42 \cdot 66}{\lambda^2 - 0 \cdot 1304}; \quad \lambda_0 = 0 \cdot 3611.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4000	+425·0°	−1·6°	Cd_{4800}	±426·6°	−2·1°	−425·4°	0·4032
,,	332·5	±0	Cd_{5086}	332·5	+1·1	333·6	,,
,,	302·5	−0·2	Ag_{5209}	302·7	−1·2	301·5	,,
,,	255·0	+0·8	Hg_{5461}	254·2	+1·3	255·5	,,
,,	208·8	−0·6	Hg_{5780}	209·4	+0·3	209·7	,,
,,	197·5	+0·8	Na_{5893}	196·7	+0·6	197·3	,,
,,	176·3	+0·2	Li_{6104}	176·1	+1·2	177·3	,,
,,	150·0	−0·1	Cd_{6438}	150·1	−0·1	150·0	,,
,,	132·8	−0·7	Li_{6708}	133·5	−0·8	132.7	,,

The solution did not exhibit mutarotation.

TABLE XXVII. 2 : 4 : 6-*Trichloranilinomethylenecamphor in benzene.*

$$[\alpha] = \pm \frac{32 \cdot 72}{\lambda^2 - 0 \cdot 1483}; \ \lambda_0 = 0 \cdot 3851.$$

Dextro			Line	Calc. [α] *c*	*Lævo*		
Concentration g./100 c.c.	Obs. [α] *o*	*o*–*c*			*o*′–*c*	Obs. [α] *o*′	Concentration g./100 c.c.
0·4012	+295·4°	−1·0°	Cd_{5086}	±296·4°	−1·8°	−294·6°	0·4040
,,	265·5	−0·5	Ag_{5209}	266·0	+0·2	266·2	,,
,,	219·1	+0·8	Hg_{5461}	218·3	+0·7	219·0	,,
,,	175·8	−0·3	Hg_{5780}	176·1	−0·3	175·8	,,
,,	164·5	+0·1	Na_{5893}	164·4	+1·3	165·7	,,
,,	145·8	−0·1	Li_{6104}	145·9	+0·2	146·1	,,
,,	123·4	+0·5	Cd_{6438}	122·9	−0·3	122·6	,,
,,	108·5	±0	Li_{6708}	108·5	+0·3	108·8	,,

The solution did not exhibit mutarotation.

TABLE XXVIII. 2 : 4 : 6-*Trichloranilinomethylenecamphor in pyridine.*

$$[\alpha] = \pm \frac{41 \cdot 70}{\lambda^2 - 0 \cdot 1315}; \ \lambda_0 = 0 \cdot 3626.$$

Dextro			Line	Calc. [α] *c*	*Lævo*		
Concentration g./100 c.c.	Obs. [α] *o*	*o*–*c*			*o*′–*c*	Obs. [α] *o*′	Concentration g./100 c.c.
0·4008	+326·8°	−1·0°	Cd_{5086}	±327·8°	+0·3°	−328·1°	0·4024
,,	299·4	+1·6	Ag_{5209}	298·2	−0·4	297·8	,,
,,	250·8	+0·7	Hg_{5461}	250·1	+0·9	251·0	,,
,,	205·6	−0·1	Hg_{5780}	205·7	−0·6	205·1	,,
,,	192·2	−1·0	Na_{5393}	193·2	+0·6	193·8	,,
,,	173·4	+0·5	Li_{6104}	172·9	−0·1	172·8	,,
,,	147·1	−0·2	Cd_{6438}	147·3	−0·6	146·7	,,
,,	131·0	±0	Li_{6708}	131·0	−0·5	130·5	,,

The solution did not exhibit mutarotation.

TABLE XXIX. 2 : 4 : 6-*Trichloranilinomethylenecamphor in ethyl alcohol.*

$$[\alpha] = \pm \frac{41 \cdot 46}{\lambda^2 - 0 \cdot 1422}; \quad \lambda_0 = 0 \cdot 3771.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4016	+354·9°	−1·0°	Cd_{5086}	±355·9°	−2·1°	−353·8°	0·4000
,,	321·2	+1·1	Ag_{5209}	320·1	+1·2	321·3	,,
,,	265·2	−0·6	Hg_{5461}	265·8	−0·8	265·0	,,
,,	216·7	+0·6	Hg_{5780}	216·1	+0·2	216·3	,,
,,	201·8	−0·3	Na_{5893}	202·1	−0·8	201·3	,,
,,	179·3	−0·6	Li_{6104}	179·9	−1·1	178·8	,,
,,	153·0	+0·7	Cd_{6438}	152·3	+0·2	152·5	,,
,,	134·5	−0·2	Li_{6708}	134·7	+0·3	135·0	,,

The solution did not exhibit mutarotation.

TABLE XXX. 2 : 4 : 6-*Trichloranilinomethylenecamphor in methyl alcohol.*

$$[\alpha] = \pm \frac{41 \cdot 76}{\lambda^2 - 0 \cdot 1372}; \quad \lambda_0 = 0 \cdot 3704.$$

Dextro			Line	Calc. $[\alpha]$ c	*Lævo*		
Concentration g./100 c.c.	Obs. $[\alpha]$ o	$o-c$			$o'-c$	Obs. $[\alpha]$ o'	Concentration g./100 c.c.
0·4004	+343·5°	−0·2°	Cd_{5086}	±343·7°	+2·4°	−346·1°	0·4032
,,	312·2	±0	Ag_{5209}	312·2	+0·3	312·5	,,
,,	259·8	+0·4	Hg_{5461}	259·4	−0·3	259·1	,,
,,	212·3	+0·2	Hg_{5780}	212·1	−0·1	212·0	,,
,,	197·4	−1·5	Na_{5893}	198·9	+0·7	199·6	,,
,,	178·6	+1·2	Li_{6104}	177·4	±0	177·4	,,
,,	149·9	−0·9	Cd_{6438}	150·8	−0·7	150·1	,,
,,	133·6	+0·1	Li_{6708}	133·5	+0·4	133·9	,,

The solution did not exhibit mutarotation.

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