SMITHSONIAN MISCELLANEOUS COLLECTIONS.
289

THE

CONSTANTS OF NATURE.

PART III.

TABLES OF EXPANSION BY HEAT

FOR

SOLIDS AND LIQUIDS.

COMPILED BY
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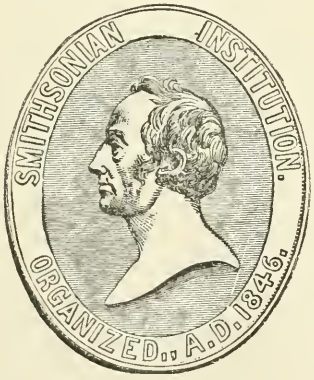

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ADVERTISEMENT.

THE following is the *third* part of a general work on the "CONSTANTS OF NATURE," prepared gratuitously for the Smithsonian Institution by Professor F. W. Clarke, and published at the expense of its fund.

JOSEPH HENRY,
Secretary Smithsonian Institution.

WASHINGTON, APRIL, 1876.

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INTRODUCTION.

In the following tables will be found data for the expansion by heat of about three hundred and fifty different substances. In every case the coëfficient for one degree is given, a rule which involved many tedious reductions during the process of compilation. It will be noticed that the linear and cubical coëfficients are collected separately. This has been so arranged in order to avoid confusion. It would have been easy for the compiler to have given in many cases either the cubical coëfficient or the linear coëfficient by itself, leaving it to the reader to multiply or to divide by three in order to obtain the other value. But this would have manifestly involved great inaccuracies, since the cubical coëfficient is not in every case exactly treble the linear. Accordingly the compiler has in no instance given a cubical value deduced by himself from a linear, or *vice versa*. Every determination given must rest solely upon the original authority of the experimenter. For errors involved in reducing to the single centigrade degree the compiler is alone responsible.

One difficulty was encountered in dealing with the expansion rates of liquids; namely, that the data given were often too full for incorporation in tables such as these. For instance: in most of Kopp's determinations, the volume of each liquid is given at many temperatures, say at every five degrees from 0° up to 100° and over. In some cases, even, determinations are given for every degree. In such instances the compiler has simply selected from the list the values at two, three, or four salient temperatures, and has referred to the original paper for the rest.

For these tables absolute completeness cannot be claimed. Nothing will be found in them relating to the expansion of liquid mixtures or of solutions. In all other directions, however, it is hoped that they will prove practically complete, at least up to January 1st, 1876.

F. W. C.

A LIST

OF SOME IMPORTANT PAPERS UPON EXPANSION.

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1. Dulong and Petit.—"Recherches sur la mesure des températures, et sur les lois de la communication de la chaleur." Ann. Chim. Phys. (2). 7. 113. 1818.
2. Hällström. "Untersuchungen über die Volumensveränderungen, welche das Wasser durch die Wärme erleidet, und Bestimmung der Temperatur bei welche dasselbe seiner grösste Dichtigkeit besitzt." Pogg. Ann. 1. 1824. p. 129. See also another paper in v. 9. 1827. p. 530.
3. Mitscherlich. "Ueber das Verhältniss der Form der krystallisirten Körper zur Ausdehnung durch die Wärme." Pogg. Ann. 1. 125. 1824.
4. Erman. "Ueber den Einfluss der Liquefaction auf das Volumen und die Ausdehnbarkeit einiger Körper." Pogg. Ann. 9. 557. 1827.
5. Mitscherlich. "Ueber die Ausdehnung der krystallisirten Körper durch die Wärme." Pogg. Ann. 10. 137. 1827.
6. Daniell. "On a new register-pyrometer, for measuring the expansion of solids, and determining the higher degrees of temperature upon the common thermometric scale." Phil. Trans. 1830. 237.
7. Daniell. "Further experiments with a new register-pyrometer for measuring the expansion of solids." Phil. Trans. 1831. 443.
8. Muncke. "Ueber die Ausdehnung der tropfbaren Flüssigkeiten durch Wärme." Mém. Acad. St. Petersburg. Savans Etrang. I. 249. 1831.
9. Stampfer. "Versuche zur Bestimmung des absoluten Gewichts des Wassers, der Temperatur seiner grössten Dichtigkeit, und der Ausdehnung derselben." Pogg. Ann. 21. 75. 1831.
10. Muncke. "Sur la dilatation de l'alcohol absolu et du carbure de soufre par la chaleur." Ann. Chim. Phys. (2). 64. 5. 1837.
11. Despretz. "Untersuchungen über das Maximum der Dichtigkeit bei Flüssigkeiten." Pogg. Ann. 41. 58. 1837. Compt. Rend. 1837.
12. Mitscherlich. "Ueber die Bestimmung der Ausdehnung krystallisirten Körper durch die Wärme." Pogg. Ann. 41. 213. 1837.

13. Despretz. "Observations sur la dilatation du soufre." Compt. Rend. 7. 589. 1839.

14. Despretz. "Recherches sur le maximum de densité de l'eau pure, et des dissolutions aqueuses." Ann. Chim. Phys. (2). 70. 5. 1839.

15. Kopp. "Recherches sur le volume spécifique." Ann. Chim. Phys. (3). 4. 462. 1842.

16. Regnault. "Note sur la dilation du verre." Ann. Chim. Phys. (3). 4. 64. 1842. Pogg. Ann. 55. 584.

17. Kopp. "Ueber den Zusammenhang zwischen der chemischen Constitution und einiger physikalischen Eigenschaften bei flüssigen Verbindungen." Ann. Chem. Pharm. 50. 71. 1844.

18. Salm-Horstmar. "Ueber die Ausdehnung des flüssigen Wassers unter dem Gefrierpunkt." Pogg. Ann. 62. 283. 1844.

19. Brunner. "Expériences sur la densité de la glace a différentes températures." Ann. Chim. Phys. (3). 14. 369. 1845.

20. Pierre. "Recherches sur la dilatation des liquides." Ann. Chim. Phys. (3). 15. 325. 1845.

21. Continuation of 20. Ann. Chim. Phys. (3). 19. 193. 1847.

22. Playfair and Joule. "On atomic volume and specific gravity." Chem. Soc. Memoirs. 2. 401 1845. Second paper, vol. 3. 57. 1848.

23. Kopp. "Untersuchungen über das specifische Gewicht, die Ausdehnung durch die Wärme, und den Siedpunkt einiger Flüssigkeiten." Pogg. Ann. 72. 1847. Two papers, pages 1. 223.

24. Pierre. "Recherches sur les propriétés physiques des liquides, et en particulier sur leur dilatation." Ann. Chim. Phys. (3). 20. 5. 1847.

25. Pierre. "Recherches sur la dilatation et sur quelques autres propriétés physiques de l'acide sulfureux anhydre et du sulfite d'oxyde d'ethyle." Ann. Chim. Phys. (3). 21. 336. 1847.

26. Pierre. "Mémoire sur la thermométrie, et en particulier sur la comparaison du thermomètre à air avec les thermomètres à liquides." Compt. Rend. 27. 213. 1848. Pogg. Ann. 76. 458.

27. Playfair and Joule. "Researches upon atomic volume and specific gravity." Journ. Chem. Soc. 1. 1849. Two papers, pages 121, 139.

28. Militzer. "Ueber die Ausdehnung des Quecksilbers durch die Wärme." Pogg. Ann. 80. 55. 1850.

29. Pierre. "Recherches sur les propriétés physiques des liquides, et en particulier sur leur dilatation." Ann. Chim. Phys. (3). 31. 118. 1851.

30. Pierre. "Recherches sur la dilatation." Ann. Chim. Phys. (3) 33. 199. 1851.

31. Kopp. "Ueber die Ausdehnung einiger fester Körper durch die Wärme." Ann. Chem. Pharm 81. 1. 1852. Pogg. Ann. 86. 156.

32. Frankenheim "Ueber das Volumen des Wassers bei verschiedenen Temperaturen, nach Is. Pierre's Beobachtungen." Pogg. Ann. 86. 451. 1852.

33. Hagen. "Ueber die Ausdehnung des destillirten Wassers unter verschiedenen Wärmegraden." Abhandl. Akad. d. Wiss. Berlin. 1855.

34. Kopp. "Beiträge zur Stöchiometrie der physikalischen Eigenschaften chemischer Verbindungen." Ann. Chem. Pharm. 96. 1855. Three papers, pages 1. 153. 303.

35. Kopp. "Untersuchungen über das specifische Gewicht, die Ausdehnung durch die Wärme, und den Siedpunkt einiger Flussigkeiten." Ann. Chem. Pharm. 94, 257. 95, 307. 98, 367. 1855-6.

36. Kopp. "Ueber die specifische Volume der Stickstoffhältigen Verbindungen." Ann. Chem. Pharm. 100. 19. 1856.

37. Pfaff. "Untersuchungen über die Ausdehnung der Krystalle durch die Wärme." Pogg. Ann. 104. 171. 1858. Second paper, v. 107. 148.

38. Drion. "Note sur la dilatabilité des liquides chauffés à des températures supérieures à celle de leur ebullition." Compt. Rend. 46. 1235. Pogg. Ann. 105. 158. 1858.

39. D'Andreéff. "Recherches sur le poids spécifique et la dilatation par la chaleur de quelques gaz condensés." Ann. Chim. Phys. (3). 56. 317. 1859.

40. Sorby. "On the expansion of water and saline solutions at high temperatures." Phil. Mag. (4). 18. 81. 1859.

41. Hahn. "On the expansion of crystalline bodies by heat." Phil. Mag. (4). 18. 155. 1859.

42. Mendelejeff. "Notiz über die Ausdehnung homologer Flüssigkeiten." Ann. Chem. Pharm. 114. 165. 1860.

43. Mendelejeff. "Ueber die Ausdehnung der Flüssigkeiten beim Erwärmen über ihren Siedepunkt." Ann. Chem. Pharm. 119. 1. 1861.

44. Calvert, Johnson, and Lowe. "On the expansion of metals and alloys." Chem. News. 3. 1861. Pages 315, 357, 371.

45. Duvernoy. "Ueber die Ausdehnung des Wässers beim Gefrieren." Pogg. Ann. 117. 454. 1862.

46. Fizeau. "Recherches sur la dilatation et la double réfraction du cristal de roche echauffé." Ann. Chim. Phys (4). 2. 143. 1864.

47. Fizeau. "Sur la dilatation du diamant et du protoxyde du cuivre crystallisé sous l'influence de la chaleur." Compt. Rend. 60. 1161. 1865.

48. Weidner. "Die Ausdehnung des Wassers bei Temperaturen unter 4° R." Pogg. Ann. 129. 300. 1866.

49. Fizeau. "Mémoire sur la dilatation des corps solides par la chaleur." Ann. Chim. Phys. (4). 8. 335. 1866.

50. Matthiessen. "On the expansion by heat of water and mercury." Phil. Trans. 1866. 231.

51. Matthiessen. "On the expansion by heat of metals and alloys." Phil. Trans. 1866. 861. Pogg. Ann. 130. 50.

52. Hirn. "Mémoire sur la thermodynamique. Recherches expérimentales sur la dilatation et sur la capacité calorifique à des hautes températures de quelques liquides très-volatiles." Ann. Chim. Phys. (4). 10. 32. 1867.

53. Rossetti. "Sur le maximum de densité et la dilatation de l'eau distillée." Ann. Chim Phys. (4). 10. 461. 1867. Second paper, v. 17, 370. 1869.

54. Louguinine. "Étude des densités et dilatations de la benzine et de ses homologues." Ann. Chim. Phys. (4). 11. 453. 1867.

55. Fizeau. "Sur la propriété que possède l'iodine d'argent de se contracter par la chaleur et de se dilater par le froid." Compt. Rend. 64. 314. 1867. Another paper, same vol., p. 771.

56. Fizeau. "Tableau des dilatations par la chaleur de divers corps simples métalliques on non métalliques, et de quelques composés hydrogènes du carbone." Compt. Rend. 68. 1125. 1869.

EXPLANATORY NOTES.

In the following tables the coëfficients of expansion given are always the coëfficients for *one degree Centigrade.* When the coëfficient is followed by one temperature, as, .00001188.40°, it is the *true* coëfficient at that temperature. When two temperatures are appended, as, .0001105, 0°–100°, the coëfficient is the mean value for any one degree between them.

But few abbreviations, save in the references to original papers, have been used. The letters S. or L., affixed to the name of a substance, indicate that it is either solid or liquid, as the case may be. The minus sign prefixed to a coëfficient, indicates that the letter represents *contraction*, instead of expansion.

The following abbreviations are employed in referring to sources of information, original papers, &c. A single number attached to the name of an authority, refers to the paper bearing that number in the list accompanying the tables. References to periodicals are followed by numbers giving (when necessary) the series, volume, and page.

Am. Chem. "American Chemist."

A. C. P. "Annalen der Chemie und Pharmacie."

A. C. Phys. "Annales de Chimie et de Physique."

Baier Akad, Phys. Abhandl. "Baierisches Akademie. Physikalische Abhandlungen."

B. D. C. G. "Berichte der Deutschen Chemischen Gessellschaft."

B. S. C. "Bulletin de la Société Chemique."

C. S. J. "Journal of the Chemical Society."

Gilb. Ann. "Gilbert's Annalen."

Gren's J. "Gren's Journal."

J. "Jahresbericht für Chemie."

J. F. P. "Journal für Praktische Chemie."

P. A. "Poggendorf's Annalen."

P. M. "Philosophical Magazine."

P. T. "Philosophical Transactions."

W. D. "Watt's Dictionary."

Young's Nat. Phil. "Young's Natural Philosophy."

A TABLE
OF
LINEAR EXPANSIONS.

I. Elementary Substances.

Name.	Coëff. of Expansion.	Authority.
Hydrogen.		
Fluorine.		
Chlorine.		
Bromine. See cubical table.		
Iodine. " "		
Lithium.		
Sodium.		
Potassium.		
Rubidium.		
Caesium.		
Silver. See also cubical table.	.00002120. 0°–100.°	Muschenbroek. W. D. 3. 68.
"	.000021000. "	Ellicot. "
"	.000018900. "	Herbert. "
"	.0000208260. "	Troughton. "
" Cupelled.	.0000190974. "	Lavoisier & Laplace. W. D. 3. 68.
" Paris standard.	.0000190868. "	Lavoisier & Laplace. W. D. 3. 68.
"	.0000198870. "	Guyton-Morveau. A. C. Phys. 90. 237.
"	.000019496. 16°.6–100°.	Daniell. 7.
"	.000020657. 16°.6–350°.	Daniell. 7.
"	.000020488. 16°.6–1024°.	Daniell. 7.
"	.000019100. 0°–100°.	Kupffer. P. A. 86. 310.
"	.000019900. "	Calvert, Johnson & Lowe.
"	.00001943. "	Matthiessen. 51. [44.
" Cast.	.00001921. At 40°.	Fizeau. 56.
Thallium.	.00003021. At 40°.	" "
Oxygen.		
Sulphur. Sicily.	.00006413. At 40°.	Fizeau. 56.
" See also cubical table.		" "
Selenium. Cast.	.00003680. "	" "
Tellurium. "	.00001675. "	" "
Lead. See also cubical table.	.00002867. 0°–100°.	Smeaton. W. D. 3. 68.
"	.0000284836. "	Lavoisier & Laplace. W. D. 3. 68.
"	.0000271948. "	Guyton-Morveau. A. C. Phys. 90. 237.

Name.	Coëff. of Expansion.	Authority.
Lead.	.0000290.	Horner. } See 31.
«	.0000295.	Prinsep. }
«	.00002785. 16°.6–100°. }	Daniell. 7.
«	.00002968. 16°.6–322°. }	
«	.0000301. 0°–100°.	Calvert, Johnson & Lowe.
«	.00002799. «	Matthiessen. 51. [44.
«	.00002924. At 40°.	Fizeau. 56.
Calcium.		
Strontium.		
Barium.		
Chromium.		
Manganese.		
Iron. See cubical table.	.00001156. 0°–100°.	Borda. W. D. 3. 68.
«	.00001258. «	Smeaton. «
« Wire.	.000014401. «	Troughton. «
« Forged.	.0000122045. « }	Lavoisier & Laplace. W.
« Wire drawn.	.0000123504. « }	D. 3. 68.
«	.0000109980. «	Guyton-Morveau. A. C. Phys. 90. 237.
«	.0000118203. «	Dulong & Petit. W. D. 3. 68.
«	.00001179. 16°.6–100°. }	Daniell. 7.
«	.00001344. 16°.6–350°. }	
«	.0000011900. 0°–100°.	Calvert, Johnson & Lowe. [44.
« Red. by H. Compressed.	.00001188. }	
« For electromagnet	.00001210. } 40°.	{ Fizeau. 56.
« Meteoric. Caille.	.00001095. }	
Steel. Annealed.	.000012200. 0°–100°. }	Muschenbroek. W. D. 3. 68.
« Tempered.	.00001370o. « }	
« Hard.	.0000122500. «	Smeaton. W. D. 3. 68.
« Blistered.	.0000115000. «	« «
«	.0000011898. « }	Troughton. W. D. 3. 68.
«	.0000011899. « }	
« Not tempered.	.0000107875. «	
« « «	.0000107956. «	
« Tempered yellow.	.0000136900. «	Lavoisier & Laplace. W.
« « «	.0000138600. «	D. 3. 68.
« Tempered at high	.0000123956. «	
« [t°.	.0000011447. «	Roy. W. D. 3. 68.
« Blistered.	.0000112500. «	Phil. Trans. 1795, p. 428.
« French cast. Tempered.	.00001322. }	
« French cast. Annealed.	.00001101. } 40°.	{ Fizeau. 56.
« English cast. Annealed.	.00001095. }	

Name.	Coëff. of Expansion.	Authority.
Steel. Soft.	.0000103. 0°–100°.	Calvert, Johnson & Lowe.
Cast iron.	.0000111111. «	Lavoisier. W. D. 3. 68. [44.
« «	.0000110940. «	Roy. «
« «	.000010707. 16°.6–100°.	Daniell. 7.
« «	.000011829. 16°.6–350°.	
« «	.000010829. 16°.6–1530°.	[44.
« «	.0000112. 0°–100°.	Calvert, Johnson & Lowe.
« « Gray.	.00001061, 40°.	Fizeau. 56.
Cobalt. Red. by H. Compressed.	.00001236, 40°.	« «
Nickel. Red. by H. Compressed.	.00001279, 40°.	« «
Uranium.		
Copper. See also cubical table.	.000019100. 0°–100°.	Muschenbroek. W. D. 3. 68.
«	.0000170.	Smeaton. See 31.
«	.0000178.	Borda. «
«	.000019188. 0°–100°.	Troughton. W. D. 3. 68.
«	.0000172244. «	Lavoisier & Laplace. W. D. 3. 68.
«	.0000171222. «	
«	.0000179013. «	Guyton-Morveau. A. C. Phys. 90. 237.
«	.0000171821. «	Dulong & Petit. W. D. 3. 68.
«	.0000171. «	Horner. See 31.
«	.0000169. «	Prinsep. «
«	.000017146. 16°.6–100°.	Daniell. 7.
«	.000019037. 16°.6–350°.	
«	.000022688. 16°.6–1091°.	
«	.00001866. 0°–100°.	Matthiessen. 51.
« Native. L. Superior.	.00001690. 40°.	Fizeau. 56.
« Commercial.	.00001678. 40°.	
Ruthenium. Semi-fused.	.00000963. 40°.	Fizeau. 56.
Rhodium. «	.00000850. 40°.	« «
Palladium. See also cubical table.	.0000100000. 0°–100°.	Wollaston. W. D. 3. 68.
«	.00001104. «	Matthiessen. 51.
« Forged.	.00001176. 40°.	Fizeau. 56.
Platinum. See also cubical table.	.0000099180. 0°–100°.	Troughton. W. D. 3. 67.
«	.0000085655. «	Borda. «
«	.0000088420. «	Dulong & Petit. «
«	.0000085675. «	Guyton-Morveau. A. C. Phys. 90. 237.
«	.0000088129. 16.°6–100°.	Daniell. 7
«	.0000089832. 16°.6–350°.	[44.
«	.00000680. 0°–100°.	Calvert, Johnson & Lowe.

Name.	Coëff. of Expansion.	Authority.
Platinum.	.00000886. 0°–100°.	Matthiessen. 51.
" Cast.	.00000899. 40°.	Fizeau. 56.
Iridium. "	.00000700. 40°.	" "
Osmium. Semi-fused.	.00000657. 40°.	" "
Molybdenum.		
Tungsten.		
Zinc. See cubical table.	.0000294200. 0°–100°.	Smeaton. W. D. 3. 68.
" Hammered.	.00003011 00. "	
"	.0000297.	Horner. See 31.
"	.0000306054. 0°–100°.	Guyton-Morveau. A. C. Phys. 90. 237.
"	.00002973. 16°.6–100°.	Daniell. 7.
"	.00002558. 16°.6–350°.	
"	.00003192. 16°.6–412°.	
"	.00002200. 0°–100°.	Calvert, Johnson & Lowe. 44.
"	.00002976. "	Matthiessen. 51.
" Distilled.	.00002918. 40°.	Fizeau. 56.
Cadmium. See also cubical table.	.0000332. 0°–100°.	Calvert, Johnson & Lowe. 44.
"	.00003159. "	Matthiessen. 51.
" Distilled.	.00003069. 40°.	Fizeau. 56.
Magnesium. Cast.	.00002694. 40°.	" "
Mercury. See cubical table.		
Indium. Cast.	.00004170. 40°.	Fizeau. 56.
Nitrogen.		
Boron.		
Phosphorus. See cubical table.		
Vanadium.		
Arsenic. Sublimed.	.00000559. 40°.	Fizeau. 56.
Antimony. See also cubical table.	.0000108300. 0°–100°.	Smeaton. W. D. 3. 68.
"	.0000098. "	Calvert, Johnson & Lowe. 44.
"	.00001056. "	Matthiessen. 51.
" Following axis. (Crystal.)	.00001692. 40°.	Fizeau. 56.
" Normal to " (Crystal.)	.00000882. 40°.	
" Mean value. (Crystal.)	.00001152. 40°.	
Bismuth. See also cubical table.	.00001392. 0°–100°.	Smeaton. W. D. 3. 68.
"	.0000133. "	Calvert, Johnson & Lowe. 44.

Name.	Coëff. of Expansion.	Authority.
Bismuth.	.00001316. 0°–100°.	Matthiessen. 51.
« Following axis. (Crystal.)	.00001621.	Fizeau. 56.
« Normal to « (Crystal.)	.00001208. 40°.	Fizeau. 56.
« Mean value. (Crystal.)	.00001346.	Fizeau. 56.
Gold. Annealed.	.000014600. 0°–100°.	Muschenbroek. W. D. 3. 68.
«	.00001 5000. «	Ellicot. «
« Parted.	.0000146606. «	Lavoisier & Laplace. W. D. 3. 68.
« Paris standard. Unannealed.	.0000155155. «	Lavoisier & Laplace. W. D. 3. 68.
« Paris standard. Annealed.	.0000151361. «	Lavoisier & Laplace. W. D. 3. 68.
«	.0000147545. 0°–100°.	Guyton-Morveau. A. C. Phys. 90. 237.
«	.00001229. 16°.6–100°.	Daniell. 7.
«	.00001271. 16°.6–350°.	Daniell. 7.
«	.0000138. 0°–100°.	Calvert, Johnson & Lowe. 44.
«	.00001470. «	Matthiessen. 51.
« Cast.	.00001443. 40°.	Fizeau. 56.
See also cubical table.		
Carbon. Diamond.	.000000000. –38°.8.	Fizeau. 47.
« «	.000000562. 0°.	Fizeau. 47.
« «	.000000707. 10°.	Fizeau. 47.
« «	.000000852. 20°.	Fizeau. 47.
« «	.000000997. 30°.	Fizeau. 47.
« «	.000001142. 40°.	Fizeau. 47.
« «	.000001286. 50°.	Fizeau. 47.
« «	.00000118. 40°.	Fizeau. 56.
See also cubical table.		
« Graphite.	.000002925. 16°.6–100°.	Daniell. 7.
« «	.000002108. 16°.6–350°.	Daniell. 7.
« «	.00000786. 40°.	Fizeau. 56.
« Gas carbon.	.00000540. 40°.	« «
« Fir charcoal.	.0000125. 0°–80°.	Heinrich. Baier. Akad. Phys. Abhandl. 1806.
« Oak «	.0000150. «	Heinrich. Baier. Akad. Phys. Abhandl. 1806.
« Anthracite.	.00002078. 40°.	Fizeau. 56.
Silicon. Cast.	.00000763. 40°.	« «
Titanium.		
Tin. See also cubical table.	.0000284000. 0°–100°.	Muschenbroek. W. D. 3. 68.
« Grain.	.0000248300. «	Smeaton. W. D. 3. 68.
« Malacca.	.0000193765. «	Lavoisier & Laplace. W. D. 3. 68.
« English.	.0000217298. «	Lavoisier & Laplace. W. D. 3. 68.
«	.0000209.	Horner. See 31.

Name.	Coëff. of Expansion.	Authority.
Tin.	.0000216382. 0°–100°.	Guyton-Morveau. A. C. Phys. 90. 237.
«	.00001764. 16°.6–100°.	Daniell. 7.
«	.00001796. 16°.6–228°.	Daniell. 7.
«	.0000273. 0°–100°.	Calvert, Johnson & Lowe. 44.
«	.00002296. «	Matthiessen. 51.
« Compressed powder	.00002234. 40°.	Fizeau. 56.
Zirconium.		
Glucinum.		
Aluminum. Commercial	.0000222. 0°–100°.	Calvert, Johnson & Lowe. 44.
« Cast.	.00002313. 40°.	Fizeau. 56.
Lanthanum.		
Didymium.		
Cerium.		
Yttrium.		
Erbium.		
Thorium.		
Niobium.		
Tantalum.		

II. Fluorides and Iodides.

Name.	Coëff. of Expansion.	Authority.
Fluor spar. $Ca F_2$.	.000019504. 0°–100.	Pfaff. 37.
Silver iodide. Ag I. Cylinder. Precipitated and compressed.	00000166. Lengthwise.	Fizeau. 55. Second paper.
	00000122. Transversely. 40°.	
	00000137. Mean value.	
Mercuric iodide. $Hg I_2$.	.00002387. 40°.	Fizeau. 55. Second paper.
Lead « $Pb I_2$.	.00003359. 40°.	« « « «
Cadmium « $Cd I_2$.	.00002916. 40°.	« « « «

III. Oxides and Sulphides.

Name.	Coëff. of Expansion.	Authority.
Ice. H_2O.	.002941.	Heinrich. Baier. Akad. Phys. Abhandl. 1806.
Hematite. Fe_2O_3.	.00000829. Following axis. } 0°-40°	Fizeau. 49.
" "	.00000836. Normal to " }	
Magnetite. Fe_3O_4.	.000009540. 0°–100°.	Pfaff. 37.
Copper oxide. Cu O.	—.000000095. 0°.	Fizeau. 47.
" " "	.000000000. 4°.1.	
" " "	.000001136. 10°.	
" " "	.000000367. 20°.	
" " "	.000000597. 30°.	
" " "	.000000828. 40°.	
" " "	.000001059. 50°.	
Zinc " Zn O. Zincite.	.00000316. Following axis. } 0°-40°	Fizeau. 49.
	.00000539. Normal to " }	
Corundum. Al_2O_3.	.0000068756. Longit. axis. } 0°-100°	Pfaff. 37.
" "	.0000065513. Horiz. " }	
" "	.00000619. Following axis. } 0°-40°	Fizeau. 49.
" "	.00000543. Normal to " }	
Quartz. SiO_2.	.000008073. Longit. axis. } 0°-100°	Pfaff. 37.
" "	.000015147. Horiz. " }	
" "	.00000692. 10°. Parallel to major axis.	Fizeau. 46.
" "	.00000717. 20°.	
" "	.00000743. 30°.	
" "	.00000769. 40°.	
" "	.00000794. 50°.	
" "	.00001281. 10°. Perpendicular to major axis.	Fizeau. 46.
" "	.00001316. 20°.	
" "	.00001350. 30°.	
" "	.00001385. 40°.	
" "	.00001420. 50°.	
" "	.00000781. Following axis. } 0°-40°	Fizeau. 49.
" "	.00001419. Normal to " }	
Rutile. TiO_2.	.00000919. Following axis. } 0°-40°	Fizeau. 49.
" "	.00000714. Normal to " }	
Tinstone. SnO_2.	.000004860. Longit. axis. } 0°-100°	Pfaff. 37. Second paper.
" "	.000004526. Horiz. " }	
" "	.00000392. Following axis. } 0°-40°	Fizeau. 49.
" "	.00000321. Normal to " }	

Name.	Coëff. of Expansion.	Authority
Pyrite. Fe S_2.	.000010084. 0°–100°.	Pfaff. 37.
Galena. Pb S.	.000018594. «	« «

IV. Sulphates, Carbonates, and Phosphates.

Name.	Coëff. of Expansion.	Authority.
Gypsum. Ca S O_4. 2 H_2 O.	.000015589. } 0°–100°.	Pfaff. 37. Second paper
« «	.000036278. } For three axes at	
« «	.000022752. } right angles.	
Celestine. Sr S O_4.	.000019205. Lesser horiz. } 0°-100°.	Pfaff. 37. Second paper.
« «	.000018513. Greater «	
« «	.000014903. Vertical.	
Barite. Ba S O_4.	.000014311. Lesser horiz. } 0°-100°.	Pfaff. 37. Second paper.
« «	.000022519. Greater «	
« «	.000014904. Vertical.	
Calcite. Ca C O_3.	.000026261. Longit. axis. } 0°-100°.	Pfaff. 37.
« «	—.0000031054. Horiz. «	
« «	.000003076. Mean value.	
Arragonite. «	.000010781. Lesser horiz. } 0°-100°.	Pfaff. 37. Second paper.
« «	.000015903. Greater «	
« «	.000031358. Vertical.	
Chalybite. Fe C O_3.	.000016133. Longit. axis. } 0°-100°.	Pfaff. 37. Second paper.
«	.000005388. Horiz. «	
Apatite.	.000011254. Longit. axis. } 0°-100°.	Pfaff. 37. Second paper.
«	.000010006. Horiz. «	

V. Silicates.

Name.	Coëff. of Expansion.	Authority.
Beryl.	.0000017214. Longit. axis. } 0°-100°.	Pfaff. 37.
«	—.0000001316. Horiz. «	
« Emerald.	.00000106. Following axis. } 40°.	Fizeau. 49.
« «	.00000137. Normal to «	

Name.	Coëff. of Expansion.	Authority.
Topaz.	.000008325. Lesser horiz. } 0°-100°	Pfaff. 37. Second paper.
«	.000008362. Greater « }	
«	.000004723. Vertical. }	
Tourmaline.	.000009369. Longit. axis. } 0°-100°	Pfaff. 37.
«	.0000077321. Horiz. « }	
Garnet.	.000008478. 0°–100°.	Pfaff. 37.
Analcime.	.000009261. «	« « Second paper.
Idocrase.	.0000078721. Longit. axis. } 0°-100°	Pfaff. 37.
«	.0000096287. Horiz. « }	
Zircon.	.000006264. Longit. axis. } 0°-100°	Pfaff. 37.
«	.0000110540. Horiz. « }	
Adularia.	.000015687. } 0°–100°.	Pfaff. 37. Second paper.
«	—.000000659. } Three axes at	
«	.000002914. } right angles.	
Hornblende.	.000008119. } 0°–100°.	Pfaff. 37. Second paper.
«	.000000843. } Three axes at	
«	.000009530. } right angles.	
Diopside.	.000008125. } 0°–100°.	Pfaff. 37. Second paper.
«	.000016963. } Three axes at	
«	—.000001707. } right angles.	
Glass. Tube.	.0000083333. 0°–100°.	Smeaton. W. D. 3. 67.
« «	.000082800. «	Deluc. «
« «	.0000077615. }	Roy. P. T. 1785. 385.
« Rod.	.0000080787. }	
«	.000006130. 0°–100°.	Dulong & Petit. W. D. 3. 69.
«	.0000091827. 100°–200°.	
«	.0000101114. 200°–300°.	
« Tube.	.0000081166. 0°–100.°	Lavoisier & Laplace. W. D. 3. 67.
« Plate.	.000000890890. «	
« « Crown.	.0000087572. «	
« « «	.0000089760. «	
« « «	.0000091751. «	
« White French.	.000008510. 0°–100.°	Kopp. 23.
« Tube.	.000009230. } Two specimens.	Hagen. J. 1856. 48.
« «	.000008766. }	
« Soft Thuringian.	.00001195.	Weinhold. P. A. 149. 186.
Wedgewood ware.	.000008813. 16.°6–100.°	Daniell. 7.
« «	.000008983. 16.°6–350.°	
Bayeux porcelain.	.0000160. } 1000°–1400.°	Deville & Troost. J. 1864. 70.
« «	.0000170. }	
« «	.0000200. Above 1500.°	

VI. Alloys.

Name.	Coëff. of Expansion.	Authority.
Platiniridium.		
One tenth Ir.	.00000884. 40.°	Fizeau. 56.
Lead and tin.		
Solder. 2 lead. 1 tin.	.0000250800. 0°–100.°	Smeaton. W. D. 3. 68.
Lead and antimony.	.00002033. 16.°6–100.°	Daniell. 7.
Type metal.	.00001952. 16.°6–264.°	
Zinc and tin.		
8 zinc. 1 tin.	.0000269200. 0°–100.°	Smeaton. W. D. 3. 68.
Copper and tin.		
8 copper. 1 tin.	.0000181700. 0°–100.	" "
Speculum metal.	.0000193300. "	" "
Bronze. ¼ tin.	.00001844. 16.°6–100.°	
" "	.00002116. 16.°6–350.°	Daniell. 7.
" "	.00001737. 16.°6–957.°	
"	.00001782. 40.°	Fizeau. 56.
Brass.	.000021600. 0°–100.°	Muschenbroek. W. D. 3. 68.
" Cast.	.0000187500. "	Smeaton. W. D. 3. 68.
" Wire.	.0000193000. "	
"	.0000178300. "	Borda. W. D. 3. 68.
"	.0000185540. "	
" English.	.0000189280. "	Roy. W. D. 3. 68.
" "	.0000189490. "	
"	.0000191880. "	Troughton. W. D. 3. 68.
"	.0000186671. "	Lavoisier & Laplace. W. D. 3. 68.
"	.0000188971. "	
" ¼ zinc.	.00002143. 16.°6–100.°	Daniell. 7.
" "	.00002162. 16.°6–350.°	
" "	.00002207. 16.°6–1006.°	
"	.00001859. 40.°	Fizeau. 56.
2 Brass + 1 zinc.	.0000205800. 0°–100.°	Smeaton. W. D. 3. 68.
16 " + 2 tin.	.0000190800. "	" "
Pewter.	.0000228300. "	" "
"	.00002033. 16.°6–100.°	Daniell. 7.
"	.00001994. 16.°6–206.°	

VII. Miscellaneous.

Name.	Coëff. of Expansion.	Authority.
Paraffine. Rangoon.	.00027854. 40.°	Fizeau. 56.
Soft coal. Charleroy.	.00002782. 40.°	« «
Ebonite.	.0000770. 16.°7–25.°3.	Kohlrausch. P. M. (4). 47. 156.
«	.0000842. 25.°3–35.°4.	
Deal wood.	Equal to Glass.	Roy. W. D. 3. 67.

A TABLE

OF

CUBICAL EXPANSIONS,

FOR SOLIDS AND LIQUIDS.

I. Elementary Substances.

Name.	Coëf. of Expansion.	Authority.
Bromine.	.001016027. —7°.	Pierre. 24.
"	.001038186. 0°.	
"	.001318677. +63.	
Iodine. Solid.	.000235.	Billet. J. 1855. 46.
" Upon fusion.	.1682.	
" Liquid.	.000856.	
Silver. Compare also with linear table.	.00005831. 0°–100.	Matthiessen. 51.
Thallium. See linear table.		
Sulphur. See linear table	.000622. 110°–130°.	Despretz. 13.
"	.000581. 110°–150°.	
"	.000454. 110°–200°.	
"	.000428. 110°–250°.	
" Native cryst.	.000183.	Kopp. 31.
" Native.	.000137. 0°–13°.2.	Kopp. A. C. P. 93. 129.
" "	.000223. 13°.2–50°.3.	
" "	.000259. 50°.3–78°.	
" "	.000620. 78°–96°.5.	
" "	.003097. 96°.5–109°.9.	
" "	.05002. In melting at 115°.	
Selenium. } See linear Tellurium. } table.		
Lead. See also linear table.	.000089.	Kopp. 31.
"	.00008399. 0°–100°.	Matthiessen. 51.

Name.	Coëff of Expansion.	Authority.
Iron. See also linear table	.0000355. 0°–100°.	Dulong & Petit. 1.
«	.0000441. 0°–300°.	
«	.000037.	Kopp. 31.
Cobalt. Nickel. } See linear table		
Copper. See also linear table.	.0000515. 0°–100°.	Dulong & Petit. 1.
«	.0000565. 0°–300°.	
«	.000055. 0°–100°.	Playfair & Joule. 27.
«	.0000767. «	
«	.000051.	Kopp. 31.
«	.00004998. 0°–100°.	Matthiessen. 51.
Ruthenium. Rhodium. } See linear table.		
Palladium. See also linear table.	.00003312. 0°–100°.	Matthiessen. 51.
Platinum. «	.0000265. 0°–100°.	Dulong & Petit. 1.
«	.0000275. 0°–300°.	
«	.00002658. 0°–100.	Matthiessen. 51.
Iridium. Osmium. } See linear table.		
Zinc. See also linear table	.000089.	Kopp. 31.
«	.00008928. 0°–100°.	Matthiessen. 51.
Cadmium. See also linear table.	.0000940.	Kopp. 31.
«	.00009478. 0°–100°.	Matthiessen. 51.
Magnesium. See linear table.		
Mercury.		For very early determinations see Dalton, Cavendish, Deluc, Achard, Roy, Shuckburgh, Cotte, Casbois, Lavoisier & Laplace, Lalande & Delisle, Rosenthal, and Lichtenberg.
«		
«		
«		
«		
«		
«		
«		
«	.00017583. 0°–100°.	Hällström. Gilb. Ann. 20. 397.
«	.00017723. 0°–350°.	
«	.00018018. 0°–100°.	Dulong & Petit. 1.
«	.00018433. 0°–200°.	
«	.00018868. 0°–300°.	
«	.00017405.	Militzer. 28.
«	.00017905. 0°.	Regnault. W. D. 3. 56. See next page.
«	.00017950. 10°.	
«	.00018001. 20°.	
«	.00018051. 30°.	

Name.	Coëff. of Expansion.	Authority.
Mercury.	.00018102. 40°.	See preceding page.
"	.00018152. 50°.	
"	.00018203. 60°.	Regnault. W. D. 3. 56.
"	.00018253. 70°.	
"	.00018304. 80°.	
"	.00018354. 90°.	See original paper for
"	.00018405. 100°.	fuller series of values.
"	.00018657. 150°.	
"	.00018909. 200°.	
"	.00019161. 250°.	
"	.00019413. 300°.	
"	.00019666. 350°.	
"	.0001812. 0°–100°.	Matthiessen. 50.
Indium. See linear table		
Phosphorus.*	.000359. 0°–17°.9.	
"	.000399. 0°–35°.9.	Erman. 4.
"	.001226. 0°–38°.2.	
"	.0010024. 0°–61°.2.	
"	.000351. 8°.3–15°.8.	
"	.000371. 15°8–41°.1.	
"	.000369. 15°8–43°.1.	
"	.000366. 8°.3–15°.8.	Kopp. A. C. P. 93. 129.
"	.000396. 15°8–41°.1.	
"	.000397. 15°8–43°.1.	
"	.0009371. 0°–70°.	
"	.03422. In melting at 44°.	
" Solid.	.000376. 0°–40°.	Pisati & DeFranchis. B.D.
" Molten.	.000520. 50°–60°.	C. G. 8. 70.
Arsenic. See linear table		
Antimony. See also linear table.	.000033.	Kopp. 31.
"	.00003167. 0°–100°.	Matthiessen. 51.
Bismuth. See also linear table.	.0000400.	Kopp. 31.
"	.00003948. 0°–100°.	Matthiessen. 51.
Gold. See also linear table.	.00004411. "	" "
Diamond. See also linear table.	.00000354. 40°.	Fizeau. 49.
Silicon. See linear table.		
Tin. See also linear table.	.0000690.	Kopp. 31.

* According to Pisati & DeFranchis, if solid Phosphorus at 40° has the volume 1.03446, its volume molten at 44° will be 1.0504. B. D. C. G. 8. 70.

Name.	Coëff. of Expansion.	Authority.
Tin.	.000070.	Kopp. A. C. P. 93. 129.
"	.000065.	Kupffer. A. C. Phys. (2). 40. 285.
"	.00006889. 0°–100°.	Matthiessen. 51.
Aluminum. See linear table.		

II. Fluorides, Chlorides, Bromides and Iodides.

Name.	Formula.	Coëff. of Expansion.	Authority.
Calcium fluoride.	$Ca\ F_2$.	.000062.	Kopp. 31.
" "	"	.000058512. 0°–100°.	Pfaff. 37. Second paper.
Potassium chloride.	K Cl.	.00010944. 0°–100°.	Playfair & Joule. 27.
Ammonium "	NH_4 Cl.	.000191. "	Playfair & Joule. 27.
Sulphur "	$S_2\ Cl_2$.	.001028. 0°–100°.	Kopp. 35. See details. Second paper.
" "	"	.001118. 0°–150°.	
Calcium "	Ca Cl_2. 6 H_2 O.	.002227. 0°–60°.	Kopp. A. C. P. 93. 129.
" "	"	.09647. In melting at 29°	Intermediate values given.
Barium "	Ba Cl_2.	.00009873. 0°–100°.	Playfair & Joule. 27.
Phosphorus trichloride.	P Cl_3.	.001128619. 0°.	Pierre. 24. Also 26.
" "	"	.001589242. 78°34.	
" "	"	.001233. 0°–50°.	Thorpe. B. D. C. G. 8. 331.
" "	"	.001289. 0°–75°.9.	Volume given for every 10°.
" oxychloride.	PO Cl_3.	.001381. 0°–50°.	Thorpe. B. D. C. G. 8. 329.
" "	"	.001230. 0°–100°.	Volume given for every 10°.
" "	"	.001237. 0°–107°23.	

Name.	Formula.	Coëff. of Expansion.	Authority.
Phosphorus sulphochloride.	$PS\ Cl_3$.	.000826. 0°–50°.	Thorpe. B. D. C. G. 8. 330.
" "	"	.0011187. 0°–100°.	Volume given for every 10°.
" "	"	.001163. 0°–125°.	
Arsenic trichloride.	$As\ Cl_3$.	.000925854. –30°	Pierre. 24.
" "	"	.000979073. 0°.	
" "	"	.001333299. 133°.81.	
Antimony "	$Sb\ Cl_3$.	.0008321. 73°.2-100°.	Kopp. 35. Second paper.
" "	"	.0009675. 73°.2-230°.	
Carbon dichloride.	$C_2\ Cl_4$.	.001002628. 0°	Pierre. 30.
" "	"	.001299538. 123°.9.	
" tetrachloride.	$C\ Cl_4$.	.001183844. 0°.	Pierre. 30.
" "	"	.001571522. 78°.1.	
" "	"	.001162988. 0°–30°.	Hirn. 52.
" "	"	.001272714. 0°–70°.	
" "	"	.001391845. 0°–110°.	
" "	"	.00155319. 0°–150°.	
Silicon "	$Si\ Cl_4$.	.001272135. –40°.	Pierre. 24.
" "	"	.001294119. 0°.	
" "	"	.001978592. 59°.	
Titanium "	$Ti\ Cl_4$.	.000876944. –25°.	Pierre. 24.
" "	"	.000942569. 0°.	
" "	"	.001357899. 136°.	
Tin "	$Sn\ Cl_4$.	.001101490. –25°.	Pierre. 24.
" "	"	.001132801. 0°.	
" "	"	.001647378. 115°.4.	
Phosphorus tribromide.	$P\ Br_3$.	.000847205. 0°.	Pierre. 24.
" "	"	.001008780. 100°.	
" "	"	.001149896. 175°.3.	
Antimony tribromide.	$Sb\ Br_3$.	.0008315. 90°–280°.	Kopp. 35. Second paper.
Silicon tetrabromide.	$Si\ Br_4$.	.000952572. 0°.	Pierre. 24.
" "	"	.001112682. 100°.	
" "	"	.001205180. 153°36.	
Silver iodide. (Maximum density of Ag I is at 116°.)	Ag I.	–.00000718. –18° to 0°	Rodwell. Chemical News. 31. 4.
" "	"	–.00003297. 0° to 21°	
" "	"	–.00005570. 21° to 67°	
" "	"	.0000436. 116°–450°	
" "	"	.011323. In changing from amorphous to cryst. at 116°.	
" "	"	.01030001. In fusing at 45°.	

III. Oxides.

Name.	Formula.	Coëff. of Expansion.	Authority.
Water.*	H_2O.	.00045176. 0°–100°.	Deluc. See Gren's J. 1. 216.
"	"	—.0000264. 0°–4°.1.	Hällström. 2. Vol. given for every degree.
"	"	.00013053. 0°–30°.	
"	"	.000231821. 0°–50°.	Munke. 8. Vol. given for every degree.
"	"	.000429279852.0°–100°.	
"	"	–.0000552.-3 to+3°.75.	Stampfer. 9. Vol. given for every degree.
"	"	.00021553. 3°.75–40°.	
"	"	.0004495. 4°–100°.	Despretz. 14. Vol. given for every degree.
"	"		
"	"	.000213616. –13°.14.	Pierre. 20.
"	"	.000430139. 97°.72.	
"	"	.00042986. 0°–100°.	Kopp. 23. Vols. given at intermediate degrees.
"	"	—.000066301. 0°.	Pierre. 26.
"	"	.000440307. 100°.	
"	"	.00042839. 0°–100°.	Hagen. J. 1856. 48. Vol. given for every five degrees.
"	"		
"	"	.00043105. 0°–100°.	Buff. A. C. P. 4th. Supp. 129
"	"	.00064713. 0°–157°.	Mendelejeff. A. C. P. 119. 1. See paper for many details.
"	"	.000430. 0°–100°.	Sorby. 40. Vol. given at some intermediate temperatures.
"	"	.000598. 0°–150°.	
"	"	.000783. 0°–200°.	

* Details regarding the expansion of water are too full for admission to these tables. Only the leading facts can be here stated. Many interesting series of determinations are unavoidably omitted.

Name.	Formula.	Coëff. of Expansion.	Authority.
Water.	H_2O.	—.000034. 0°–4°.	Weidner. 48. Vol. given for every degree.
"	"	—.0001362. –10° to 4°.	
"	"	.0002500. 4°–50°.	Matthiessen. 50. Vol. given for every degree.
"	"	.0004496. 4°–100.	
"	"	.00051655. 4°–120°.	Hirn. 52. Intermediate values given.
"	"	.00079498. 4°–200°.	
"	"	—.00003292. 0°-4°07.	Rossetti. 53. Every degree given.
"	"	.00025996. 4°07–50°.	
"	"	.000392. –10° to 100°.	Rossetti. 53. Second paper. Vol. given at every degree.
Ice.	"	.0001585. 0°–1°.	Plücker and Geisler. P. A. 86. 238.
Iodine pentoxide.	I_2O_5.	.000066. 0°–51°.	Ditte. A.C.Phys. (4). 21. 5.
Sulphur dioxide. L.	SO_2.	·001496377. –25°.85.	Pierre. 26.
" "	"	.001819947. –8°.	
" "	"	.00193. 0°–18°.	Drion. 38. Compare also A. C. Phys. (3). 56. 5.
" "	"	.00368. 91°–99°.5.	
" "	"	.00463. 108°5–115°5.	
" "	"	.00533. 116°–122°.	
" "	"	.00600. 122°–127°.	
" "	"	·00190. –10° to –5°.	D'Andreéff.
" "	"	.00194. –5° to 0°.	
" "	"	.00198. 0°–5°.	
" "	"	.00202. 5°–10°.	
" "	"	.00206. 10°–15°.	
" "	"	.00210. 15°–20.	
" "	"	.00215. 20–25°.	
" "	"	.00220. 25°–30°.	
" "	"	.00225. 30°–35°.	
" "	"	.00230. 35°–40°.	
Sulphur trioxide.	SO_3.	.0027. 25°–45°.	Schultz-Sellack. P. A. 139. 480.
Lead monoxide.	Pb O.	.0000795. 0°–100°.	Playfair & Joule. 27.
Manganic oxide.	Mn_2O_3.	.0000522. "	" "
Ferric "	Fe_2O_3.	.000040. Hematite.	Kopp. 31.
" "	"	.00002501. 40°.	Fizeau. 49.
Ferroso-ferric "	Fe_3O_4.	.000029. Magnetite.	Kopp. 31.
" " "	"	.000028620. 0°–100°.	Pfaff. 37. Second paper.
Copper oxide.	Cu O.	.00000279. 40°.	Fizeau. 49.
Zinc "	Zn O.	.00001394. 40°. Zincite.	" "

Name.	Formula.	Coëff. of Expansion.	Authority.
Magnesium oxide. Cryst.	Mg O.	.00003129. 40°.	Fizeau. 49.
" "	"	.000003104. 0°–100°.	Calcined at 350°, at 450°, at dark red heat, and at bright red heat.
" "	"	.000002402. "	
" "	"	.000001764. "	
" "	"	.000001634. "	Ditte. C. S. J. (2). 9. 869.
Mercuric oxide.	Hg O.	.00005802. 0°–100°.	Playfair & Joule. 27.
Nitrous " L.	N_2 O.	.00428. −5° to 0°.	
" "	"	.00422. 0°–5°.	
" "	"	.00484. 5°–10°.	D'Andreéff. 39.
" "	"	.00656. 10°–15°.	
" "	"	.00872. 15°–20°.	
Hyponitric acid. L.	N O_2.	.001445. 0°.	Coëff. given for every 10° from 0° to 90°.
" "	"	.002021. 50°.	
" "	"	.003081. 90°.	Drion. A. C. Phys. (3). 56. 5.
Arsenic trioxide. Cryst.	As_2 O_3.	.00012378. 40°.	Fizeau. 49.
Senarmontite.	Sb_2 O_3.	.00005889. "	" "
Carbon dioxide. L.	C O_2.	.0142. 0°–30°.	Thilorier. See 38.
" "	"	.00475. −10° to −5°.	
" "	"	.00492. −5° to 0°.	
" "	"	.00540. 0°–5°.	
" "	"	.00629. 5°–10°.	D'Andreéff. 39.
" "	"	.00769. 10°–15°.	
" "	"	.00975. 15°–20°.	
" "	"	.01277. 20°–25°.	
Quartz.	Si O_2.	.000039.	Kopp. 31.
"	"	.000042.	
"	"	.00003840. 0°–100°.	Pfaff. 37. Second paper.
"	"	.00003619. 40°.	Fizeau. 49.
Rutile.	Ti O_2.	.000032.	Kopp. 31.
"	"	.00002347. 40°.	Fizeau. 49.
Tin dioxide. Powder	Sn O_2.	.0000172. 0°–100°.	Playfair & Joule. 27.
Tinstone.	"	.000016.	Kopp. 31.
"	"	.00001389. 0°–100°.	Pfaff. 37. Second paper.
"	"	.00001034. 40°.	Fizeau. 49.
Corundum.	Al_2 O_3.	.00001995. 0°–100°.	Pfaff. 37. Second paper.
"	"	.00001705. 40°.	Fizeau. 49.
Spinel ruby.	Mg O. Al_2 O_3.	.00001787. "	" "
Pleonaste.	———	.00001805. "	" "
Gahnite.	Zn O. Al_2 O_3.	.00001766. "	" "
Kreittonite.	———	.00001750. "	" "

IV. Sulphides.

Name.	Formula.	Coëff. of Expansion.	Authority.
Selenium sulphide.	Se S.	.00014176. 0°–52°.	Ditte. A. C. P. 163. 187.
Lead «			
In powder.	Pb S.	.0001045. 0°–100°.	Playfair & Joule. 27.
Galena.	«	.0000680.	Kopp. 31.
«	«	.000055782. 0°–100°.	Pfaff. 37. Second paper.
Pyrite.	Fe S_2.	.000034.	Kopp. 31.
«	«	.000030252. 0°–100°.	Pfaff. 37. Second paper.
Blende.	Zn S.	.0000358.	Kopp. 31.
Carbon disulphide.	C S_2.	.0011016. −50° to 0°.	Muncke. 10.
« «	«	.00119625. 0°–40°.	Vol. given for every degree from —50° to + 70°.
« «	«	.0012517. 0°–70°.	
« «	«	.001072705. −34°.91.	Pierre. 20.
« «	«	.001332332. 59°.55°.	
« «	«	.0011139804. 0°.	Pierre. 26.
« «	«	.001402735. 47°.9°.	
« «	«	.001236617. 0°–40°.	Hirn. 52.
« «	«	.001325986. 0°–80°.	
« «	«	.001459566. 0°–120°.	
« «	«	.00166076o. 0°–180°.	

V. Hydrates.

Name.	Formula.	Coëff of Expansion.	Authority.
Iodic acid.	$H I O_3$.	.0002242. 0°–58°.8.	Ditte. A. C. Phys. (4). 21. 5.
Sulphuric "	$H_2 S O_4$	.00031.	Achard. Young's Nat. Phil. 2. 392.
" "	"	.00057849. 0°–100°.	Every 10° given from –30° to +230°.
" "	"	.000596443. 0°–200°.	
" "	"	.00060373. 0°–230°.	Muncke. 8.
" "	"	.0005656. 0°–23°.	Marignac. A. C. Phys. (4). 22. 420.
" "	"	.0005585. 20°.	" C. S. J. (2). 9. 1125.
Nitric "	$H N O_3$.	.00114885. 0°–100°.	Muncke. 8.
" "	"	.00117808. 0°–115°.	Every 5° given from –20° to +115°.

VI. Sulphates, Hyposulphites and Chromates.

Name.	Formula.	Coëff of Expansion.	Authority.
Potassium sulphate.	$K_2 S O_4$.	.00010697. 0°–100°.	Playfair & Joule. 27
" bisulphate.	$K H S O_4$.	.00012287. "	" "
Ammonium sulphate.	$(N H_4)_2 S O_4$.	.00010934. "	" "
Gypsum. See linear table.	$Ca S O_4 . 2 H_2 O$.	.000750. "	Pfaff. 37. Second paper.
Celestine. See linear table.	$Sr S O_4$	.000061.	Kopp. 31.
"	"	.00005261. 0°–100°.	Pfaff. 37. Second paper.
Barite. See linear table.	$Ba S O_4$.	.000058.	Kopp. 31.
"	"	.00005190. 0°–100°.	Pfaff. 37. Second paper.

Name.	Formula.	Coëff. of Expansion.	Authority.
Ferrous sulphate.	$Fe\,S\,O_4.\ 7\,H_2\,O.$	.0001153. 0°–100°.	Playfair & Joule. 27
Magnesium sulphate.	$Mg\,S\,O_4.\ 7\,H_2\,O.$	.0001019. «	« «
Copper sulphate	$Cu\,S\,O_4.\ 5\,H_2\,O.$	.00005315. «	Three samples.
« «	«	.0000812. «	Playfair & Joule. 27
« «	«	.00009525. «	
Copper ammonium sulphate	$(NH_4)_2Cu(SO_4)_2.6H_2O$	.00006113. 0°–100°.	Playfair & Joule. 27
Copper potassium sulphate.	$K_2\,Cu\,(S\,O_4)_2.\ 6\,H_2\,O.$	.00009043. «	« «
Zinc potassium sulphate.	$K_2\,Zn\,(S\,O_4)_2.\ 6\,H_2\,O.$	.00008235. «	« «
Magnesium potassium sulphate.	$K_2\,Mg\,(S\,O_4)_2.\ 6\,H_2\,O.$	.00009372. «	« «
Magnesium ammonium sulphate.	$(NH_4)_2Mg(SO_4)_2.6H_2O$	.00007161. «	« «
Common alum.	$K\,Al\,(S\,O_4)_2.\ 12\,H_2\,O.$	.00003682. 0°–200°.	Playfair & Joule. 27
Chrome «	$K\,Cr\,(S\,O_4)_2.\ 12\,H_2\,O.$	.00005242. «	« «
Sodium hyposulphite.	$Na_2\,S_2\,O_3.\ 5\,H_2\,O.$	.00015111. 0°–45°.	Kopp. A. C. P. 93. 129. Vol. given for every 10°, from 0° to 80°.
« «	«	.000925. 0°–80°.	
« «	«	.05095. In melting at 45°	
Potassium chromate.	$K_2\,Cr\,O_4.$	.00011005. 0°–100°.	Playfair & Joule. 27
« «	«	.0001134. «	
Potassium dichromate.	$K_2\,Cr_2\,O_7.$	.000122. «	Playfair & Joule. 27

VII. Chlorates, Nitrates and Phosphates.

Name.	Formula.	Coëff. of Expansion.	Authority.
Potassium chlorate.	$K Cl O_3$.	.00017112. 0–100.°	Playfair & Joule. 27
Sodium nitrate.	$Na N O_3$.	.000128. «	« «
Potassium «	$K N O_3$	.0001967. «	Playfair & Joule. 27.
« « Crystal	«	.00017237. «	
« « Powder	«	.0001947. «	
Barium nitrate.	$Ba N_2 O_6$.	.00004523. «	Playfair & Joule. 27.
Lead «	$Pb N_2 O_6$.	.0000839. «	« «
Sodium phosphate	$Na_2HPO_4.12H_2O$	.0001371. 0°–35°.	Kopp. A. C. P. 93. 129. Vol. given for every 10° from 0° to 70°.
« «	«	.0010286. 0°–70°.	
« «	«	.05085. In melting at 25°.	
Apatite. See linear table.		.00003123. 0°–100°.	Pfaff. 37. Second paper.

VIII. Carbonates.

Name.	Formula.	Coëff. of Expansion	Authority.
Calcite. See linear table.	$Ca C O_3$.	.0000196. 0°–100°.	Dulong & Mitscherlich. P. A. 1. 127.
«	«	.0000174.	Mitscherlich. P. A. 10. 149.
«	«	.000018.	Kopp. 31.
«	«	.00002010. 0°–100°.	Pfaff. 37. Second paper.
Arragonite. See linear table.	«	.000065.	Kopp. 31.
«	«	.00005802. 0°–100.°	Pfaff. 37. Second paper.
Chalybite. See linear table.	$Fe C O_3$	.000035. (Impure.)	Kopp. 31.
«	«	.00002688.	Pfaff. 37. Second paper.
Dolomite.	$(Ca Mg) C O_3$.	.000035.	Kopp. 31.

IX. Silicates.

Name.	Coëff. of Expansion.	Authority.
Emerald. See linear table	.00000168. 40°.	Fizeau. 49.
Beryl. " "	.00000105. 0°–100°.	Pfaff. 37. Second paper.
Topaz. " "	.00002137. "	" " "
Tourmaline. " "	.00002181. "	" " "
Garnet. " "	.000025434. "	" " "
Analcime. " "	.000027783. "	" " "
Idocrase. " "	.00002700. "	" " "
Zircon. " "	.00002835. "	" " "
Orthoclase	.000026.	Kopp. 31.
"	.000017.	Kopp. 31.
Adularia. See linear table	.00001794. 0°–100°.	Pfaff. 37. Second paper.
Hornblende. " "	.00002845. "	" " "
Diopside. " "	.00002330. "	" " "
Glass. See linear table.	.0000258. 0°–100°.	
"	.0000275. 0°–200°.	Dulong & Petit. 1.
"	.0000304. 0°–300°.	
"	.0000265445. 0°–1°.	Muncke. 8.
" White. Tube.	.00002648. 0°–100°.	
" " Globule.	.00002592. "	
" " "	.00002514. "	
" Green. Tube.	.00002299. "	
" " Globule.	.00002132. "	
" Swedish. Tube.	.00002363. "	
" " Globule.	.00002441. "	
" " "	.00002411. "	Regnault. 16.
" Hard French. Tube.	.00002142. "	
" " " Globule	.00002242. "	
" Crystal. Tube.	.00002101. "	
" " Globule.	.00002330. "	
" Globe.	.00002304. "	
" "	.00002349. "	
" Common tube.	.00002579. m. of 12. 0°–1°.	
" Common.	.0000276. 0°–100°.	
" "	.0000305. 0°–300°.	
" Crystal Glass from	.0000228. 0°–100°.	Regnault. W. D. 3. 71.
" Choisy le Roi.	.0000233. 0°–300°.	
" White French.	.000025531. 0°–100°.	Kopp. 23.
" Soft soda glass.	.000026.	Kopp. 31.
" " " "	.000024.	
" Hard potash glass.	.000021.	

Name.	Coëff. of Expansion.	Authority.
Glass.	.0000277. 0°–100°.	Mendelejeff. A.C.P.119.1.
« From St. Gobain.	.00002331. 40°.	Fizeau. 49.
«	.00002566. 0°–100°.	Matthiessen. 50.
« Soft Thuringian.	.0000305.	Weinhold. P. A. 149. 186.
« «	.0000359.	
Bayeux Porcelain.	.0000108. 0°–860°.	Deville & Troost. W. D. 3. 71.
« «	.0000108. 0°–100°.	

X. Miscellaneous Inorganic Bodies.

Name.	Coëff. of Expansion.	Authority.
Ammonia. NH_3.	.00146. 10°.	Jolly. A. C. P. 170. 190.
«	.00166. 10°.4.	
«	.00152. 11°.	
«	.00190. —10° to —5°.	D'Andreéff. 39.
«	.00200. —5° to 0°.	
«	.00210. 0°–5°.	
«	.00220. 5°–10°.	
«	.00230. 10°–15°.	
«	.00240. 15°–20°.	
Aqua ammonia.	.00044069. 0°–45°.	Muncke. S. Vol. given at every degree from –15° to +45°.
Aqueous hydrochloric acid.	.00056355. 0°–45°.	Muncke. S. Vol. given for every 5° from –20° to +45°.
Cyanic acid. L.	.0003300. —20° to —14°.	Troost & Hautefeuille. J. 21. 314.
« «	.0006999. —20° to 0°.	
« «	.0008450. —3° to 0°.	
Chloronitric acid.	.0020091. 0°–6°.	Baudrimont. J. F. P. 31. 478.
« «	.0035648. 6°.4–18°.4.	

XI. Alloys.

Name.	Coëff. of Expansion.	Authority.
Lead and tin.		
$Pb\ Sn_4$.	.00007188. 0°–100°.	Matthiessen. 51.
$Pb_4\ Sn$.	.00008419. «	« «
Lead and cadmium.		
Pb Cd.	.00009138. 0°.–100°.	Matthiessen. 51.
Lead and bismuth.		
$Pb_2\ Bi$.	.00008621. 0°.–100°.	Matthiessen. 51.
$Pb\ Bi_{24}$.	.00004086. «	« «
Lead and mercury.		
1 vol. Pb with 2 vols. Hg	.00012515.	Kupffer. A. C. Phys. (2). 40. 285.
1 « 3 «	.00012884.	« «
1 « 4 «	.00013291.	« «
Silver and copper.		
36.1 per cent. silver.	.00005436. 0°–100°.	Matthiessen. 51.
71.6 « «	.00005713. «	« «
Silver and platinum.		
66.6 per cent. silver.	.00004568. 0°–100°.	Matthiessen. 51.
Silver and gold.		
$Ag_4\ Au$.	.00005166. 0°–100°.	Matthiessen. 51.
Ag Au.	.00004916. «	« «
$Ag\ Au_4$.	.00004300. «	« «
Copper and gold.		
66.6 per cent. gold.	.00004657. 0°–100°.	Matthiessen. 51.
Copper and zinc.		
Brass. 71 per cent. Cu.	.00005719. 0°–100°.	Matthiessen. 51.
Zinc and tin.		
$Zn\ Sn_4$.	.00007184. 0°–100°.	Matthiessen. 51.
$Zn\ Sn_6$.	.00007058. «	« «
Tin and bismuth.		
$Sn_2\ Bi$.	.00005098. 0°–100°.	Matthiessen. 51.
$Sn\ Bi_{44}$.	.00004064. «	« «
Tin and gold.		
$Sn_2\ Au$.	.00004233. 0°–100°.	Matthiessen. 51.
$Sn_7\ Au_2$.	.00004428. «	« «
Tin and mercury.		
$Sn_3\ Hg$.	.0000998.	Kupffer. A. C. Phys. (2). 40. 285.
$Sn_2\ Hg$.	.000103.	« «
Sn Hg.	.000122.	« «
$Sn\ Hg_2$.	.0001313.	« «

Name.	Coëff. of Expansion.	Authority.
1 vol. Sn to 1 vol. Hg.	.000119576.	Kupffer. A. C. Phys. (2). 40. 285.
1 « 2 «	.00014055.	« «
1 « 3 «	.0001245.	« «
Lead, tin, and bismuth.	.00002304. 0°–56°.	Erman. 4.
2 parts Bi, 1 part Pb, 1 part Sn.	—.00008387. 0°–62°.	Erman. 4.
«	—.00010304. 0°–69°.	Erman. 4.
«	—.00008146. 0°–75°.	Erman. 4.
«	.0000005747. 0°–87°.	Erman. 4.
«	.0001792. 0°–100°.	Erman. 4.
«	.00017475. 0°–200°.	Erman. 4.
«	.00003143. 0°–70°.	Kopp. A. C. P. 93. 129. Volume given for every 10° from 0° to 110°.
«	—.00005611. 0°–95°.	Kopp. A. C. P. 93. 129. Volume given for every 10° from 0° to 110°.
«	.0001104. 0°–100°.	Kopp. A. C. P. 93. 129. Volume given for every 10° from 0° to 110°.
«	.0001411. 0°–110°.	Kopp. A. C. P. 93. 129. Volume given for every 10° from 0° to 110°.

XII. Hydrocarbons.

Name.	Formula.	Coëff. of Expansion.	Authority.
Butyl.	$(C_4 H_9)_2$.	.001404. 0°–100°.	Kopp. 35. Second paper. Values given for intermediate t°'s.
«	«	.001441. 0°–110°.	Kopp. 35. Second paper. Values given for intermediate t°'s.
Benzol.	$C_6 H_6$.	.001213. 0°–25°.	Kopp. 23. Second paper. Vol. given for every 5° from 0° to 85°.
«	«	.001260. 0°–50°.	Kopp. 23. Second paper. Vol. given for every 5° from 0° to 85°.
«	«	.001317. 0°–75°.	Kopp. 23. Second paper. Vol. given for every 5° from 0° to 85°.
«	«	.001343. 0°–85°.	Kopp. 23. Second paper. Vol. given for every 5° from 0° to 85°.
«	«	.001205. 0°–20°.	Louguinine. 54. Vol. given for every 5° from 0° to 80°.
«	«	.001250. 0°–40°.	Louguinine. 54. Vol. given for every 5° from 0° to 80°.
«	«	.001293. 0°–60°.	Louguinine. 54. Vol. given for every 5° from 0° to 80°.
«	«	.0013375. 0°–80°.	Louguinine. 54. Vol. given for every 5° from 0° to 80°.
«	«	.00131. 0°–75°.	Pisati & Paterno. C. S. J. (2). 12. 686. Volume also given at 15°, 25°, and 50°.
Toluol	$C_7 H_8$.	.001060. 0°–20°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
«	«	.0010975. 0°–40°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
«	«	.0011333. 0°–60°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
«	«	.001171. 0°–80°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
«	«	.001206. 0°–100°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
Xylol.	$C_8 H_{10}$.	.000985. 0°–20°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
«	«	.001016. 0°–40°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
«	«	.001048. 0°–60°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
«	«	.001081. 0°–80°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
«	«	.001113. 0°–100°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.

Name.	Formula.	Coëff. of Expansion.	Authority.
Cumol.	$C_9 H_{12}$.	.0010907. 0°–100°.	Pisati & Paterno. C. S. J. (2). 12. 686. Volume given at 25°,50°, and 75°.
Cymol.	$C_{10} H_{14}$.	.001028. 0°–100°.	Kopp. 35. Volume given at intermediate temperatures.
«	«	.0011661. 0°–180°.	
«	«	.000954. 0°–50°.	Pisati & Paterno. C. S. J. (2). 12. 686. Values given for every 5°.
«	«	.00102389. 0°–100°.	
« From cummin oil.	«	.000920. 0°–20°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
« « « «	«	.000946. 0°–40°.	
« « « «	«	.0009725. 0°–60°.	
« « « «	«	.0009855. 0°–80°.	
« « « «	«	.0010229. 0°–100°.	
« « camphor.	«	.0009512. 0°–40°.	Louguinine. 54. Vol. given for every 10° from 0° to 100°.
« « «	«	.0010581. 0°–100°.	
Naphthaline. L.	$_{10} H_8$.	.0007836. 79°.2–100°.	Kopp. 35. Second paper. Intermediate values given.
«	«	.0010021. 79°.2–220°.	
Terebene.	$C_{10} H_{16}$.	.000896554. 0°.	Pierre. 26 and 30.
«	«	.001327673. 161°.	
Oil of turpentine.	«	.0010346. 0°–150°.	Frankenheim. J. 1. 68.
« «	«	—.00088. —10° to 0°.	Kopp. A. C. P. 93. 129. Vol. given for every 5° from —10° to + 110°.
« «	«	.001051. 0°–100°.	
« «	«	.001062. 0°–110°.	
« «	«	.00085019. 0°–40°.	Hirn. 52.
« «	«	.00095838. 0°–80°.	
« «	«	.00103773. 0°–120°.	
« «	«	.00111478. 0°–160°.	
« «	«	.00066, to .00068.	Gladstone. C. S. J. (2). 10. 1.
« citron.	«	.0010227. 0°–135°.	Frankenheim. J. 1. 68. Two samples.
« «	«	.0010368. 0°–120°.	
« rosewood.	$C_{15} H_{24}$.	.000642, to .00065.	Gladstone. C. S. J. (2). 10. 1.

Name.	Formula.	Coëff. of Expansion.	Authority.
Rectified petroleum.	———	.00111576. 0°–95°.	Muncke. 8. Volume given for every 5° from 0° to 95°.
Petroleum.	———	.001039. 0°–100°.	Frankenheim. P. A. 72. 422. Vol. given for every 5°.
"	———	.0010669. 0°–120°.	

XIII. Compounds Consisting of C, H, and O.

Name.	Formula.	Coëff. of Expansion.	Authority.
Methyl alcohol.	$C H_4 O$.	.001131647. —37°.99.	Pierre. 20.
" "	"	.001348109. 69°.38.	
" "	"	.001109738. —35°.	Pierre. 21 and 26.
" "	"	.001185570. 0°.	
" "	"	.001491250. 63°.	
" "	"		Kopp. 23. Values given for intermediate temperatures.
" "	"	.0012534. 0°–65°.	
" "	"		
" "	"		Kopp. 35. Values given for intermediate temperatures.
" "		.0012483. 0°–60°.	
" "		.00129. 10°–20°.	Dupré. P. A. 148. 236.
Ethyl alcohol.	$C_2 H_6 O$.	.0007184. –50° to 0°.	Muncke. 8. Vol. given for every degree from –50° to + 70°.
" "	"	.0010879. 0°–50°.	
" "	"	.0011328. 0°–70°.	
" "	"	.0005418. –100° to 0°.	Muncke. 10. Every degree given from –100° to +70°.
" "	"	.0011383. 0°–70°.	
" "	"	.0010503. 0°–30°.	Guy Lussac. 1816. See P. A. 140 137.
" "	"	.0010313. 0°–30°.	" " 1822.
" "	"	.000994456. –32°.22.	Pierre. 20.
" "	"	.001194785. 76°.73.	
" "	"	.000944782. –30°.	Pierre. 21 and 26.
" "	"	.001048630. 0°.	
" "	"	.001347576. 78°. 3.	

Name.	Formula.	Coëff. of Expansion.	Authority.
Ethyl alcohol.	$C_2 H_6 O.$	.0011246. 0°–50°.	Kopp. 23. Vol. given for every 5° from 0° to 80°.
" "	"	.0012169. 0°–80°.	
" "	"	.0012957. 0°–99°.87.	Mendelejeff. A. C. P. 119. 1.
" "	"	.0014477. 0°–130°.9.	
" "	"	.0010700. 0°–30°.	V. Baumhauer & v. Moorsel. P. A. 140. 361. Vol. given for every 5°.
" "	"	.001085855. 0°–50°.	Hirn. 52.
" "	"	.0012734849. 0°–100°.	
" "	"	.00160491. 0°–150°.	
" "	"	.0023832443. 0°–200°.	
Propyl "	$C_3 H_8 O.$	.0010600. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234.
" "	"	.0011633. 0°–98°.	
Butyl "	$C_4 H_{10} O.$	.001160. 0°–100°.	Pierre & Puchot. A. C. P. 163. 268.
" "	"	.001189. 0°–108°.	Vol. given for every 10°.
Amyl "	$C_5 H_{12} O.$	.000878287. –15°.	Pierre. 21 and 26.
" "	"	.000890011. 0°.	
" "	"	.001339328. 100°.	
" "	"	.001606382. 131°.8.	
" "	"	.0009594. 0°–50°.	Kopp. 23. Second paper. Vol. given for every 5° from 0° to 135°.
" "	"	.0010808. 0°–100°.	
" "	"	.0012066. 0°–135°.	
" "	"	.001088. 0°–100°.	Kopp. 35. Values given for intermediate temperatures.
" "	"	.001277. 0°–140°.	
" " Optically inactive.	"	.0008745. 0°–50°.	Erlenmeyer & Hell. A. C. P. 160. 257. Values given for volume at intermediate temperatures.
" " Optically inactive.	"	.0010642. 0°–100°.	
" " Optically inactive.	"	.001188. 0°–120°.	
" " Optically active.	"	.0009514. 0°–50°.	
" " Optically active.	"	.0010739. 0°–100°.	
" " Optically active.	"	.0011323. 0°–120°.	
Amylene hydrate.	$C_5 H_{12} O.$	.00085. 0°–18°.	Wagner & Saytzeff. A. C. P. 179. 320.
Trimethyl carbinol.	$C_4 H_{10} O.$	.00136. 30°–50°.	Butlerow. A. C. P. 162. 228.
Hydrate of trimethyl carbinol.	$(C_4H_{10}O)_2H_2O$	.00108. 0°–30°.	" "

Name.	Formula.	Coëff. of Expansion.	Authority.
Diethyl carbinol.	$C_5 H_{12} O.$	.00102. 0°–18°.	Wagner & Saytzeff. A. C. P. 179. 320.
Dimethyl pseudopropyl carbinol.	$C_6 H_{14} O.$	.00099. 0°–50°.	Prianichnickow. A. C. P. 162. 69.
Ethyl oxide.	$C_4 H_{10} O.$	.001441. −21° to 0°.	Muncke. 8. Vol. given for every 5° from −21° to +40°
" "	"	.0015881. 0°–40°.	
" "	"	.001470095. −15°.36.	Pierre. 20.
" "	"	.001629718. 38°.14°.	
" "	"	.001518. 0°–10°.	Kopp. 23. Second paper. Vol. given for every 5° from 0° to 35°.
" "	"	.001561. 0°–20°.	
" "	"	.001636. 0°–35°.	
" "	"	.001513245. 0°.	Pierre. 26.
" "	"	.001832171. 35°.5.	
" "	"	.002095. 0°–99°.82.	Mendelejeff. A. C. P. 119. 1. Other values given.
" "	"	.002697. 0°–157°.	
Formic acid.	$C H_2 O_2.$	.0010120. 0°–25°.	Kopp. 23. Second paper. Volume given for every 5° from 0° to 105°.
" "	"	.0010388. 0°–50°.	
" "	"	.0010731. 0° 75°.	
" "	"	.0011241. 0°–105°.	
Acetic "	$C_2 H_4 O_2.$	.0010902. 0°–50°.	Kopp. 23. Second paper. Vol. given for every 5° from 0° to 120°.
" "	"	.0011717. 0°–100°.	
" "	"	.0012178. 0°–120°.	
Propionic acid.	$C_3 H_6 O_2.$	.001192. 0°–100°.	Kopp. 35. Second paper. Vol. given for intermediate temperatures.
" "	"	.001290. 0°–150°.	
Butyric acid.	$C_4 H_8 O_2.$	.0010878. 0°–50°.	Kopp. 23. Second paper. Vol. given for every 5°, from 0° to 160°.
" "	"	.0011565. 0°–100°.	
" "	"	.0012749. 0°–160°.	
" "	"	.001025720. 0°.	Pierre. 26.
" "	"	.001598958. 163°.	
" "	"	.001144695. 100°.	Pierre. 29.
Isobutyric "	"	.001092. 0°–50°.	Morkownikoff. A. C. P. 138. 368.
" "	"	.001166. 0°–100°.	
Valeric "	$C_5 H_{10} O_2.$	.0011060. 0°–100°.	Kopp. 35. Second paper. Intermediate values given
" "	"	.0012717. 0°–180°.	

Name.	Formula.	Coëff. of Expansion.	Authority.
Valeric acid. From isobutylcyanide.	$C_5 H_{10} O_2$.	.0010056. 0°–50°.	Erlenmeyer & Hell. A. C. P. 160. 257.
" " "	"	.0010794. 0°–100°.	
" " "	"	.0011132. 0°–120°.	
" " From valerian.	"	.0010008. 0°–50°.	Volumes given for every 10°.
" " "	"	.0010775. 0°–100°.	
" " "	"	.0011098. 0°–120°.	
" " From fusel oil.	"	.00100548. 0°–50°.	
" " "	"	.0010816. 0°–100°.	
" " "	"	.0011157. 0°–120°.	
Trimethylacetic acid.	"	.00112. 50°–75°.	Butlerow. B. D. C. G. 7. 728.
" "	"	.00120. 75°–100°.	
Stearic acid.	$C_{18} H_{36} O_2$.	.00052. 9°.2–33°.8.	Kopp. A. C. P. 93. 129.
" "	"	.00066. 33°.8–45°.5.	
" "	"	.00115. 45°.5–61°.2.	
" "	"	.00475. 61°.2–66°.5.	
" "	"	.00060. 9°.2–33°.8.	
" "	"	.00081. 33°.8–45°.5.	
" "	"	.00117. 45°.5–61°.2.	
" "	"	.00347. 61°.2–66°.5.	
" "	"	.10988. Expansion in moment of fusion at 70°.	
Acetic anhydride.	$C_4 H_6 O_3$.	.0012450. 0°–100°.	Kopp. 35. Values given at intermediate temperatures.
" "	"	.0013257. 0°–140°.	
Methyl formate.	$C_2 H_4 O_2$.	.0014413. 0°–15°.	Kopp. 23. Second paper. Vol. given for every 5°.
" "	"	.0015514. 0°–35°.	
Ethyl "	$C_3 H_6 O_2$.	.001236497. −32°.43.	Pierre. 20.
" "	"	.001522943. 61°.54.	
" "	"	.0013924. 0°–25°.	Kopp. 23. Second paper. Vol. given for every 5°.
" "	"	.0014891. 0°–55°.	
" "	"	.001325205. 0°.	Pierre. 26.
" "	"	.001679323. 52°.9.	
Propyl "	$C_4 H_8 O_2$.	.001306. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Intermediate values also given.
" "	"	.0014123. 0°–82°.7.	
Butyl "	$C_5 H_{10} O_2$.	.001240. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Intermediate values given.
" "	"	.0013655. 0°–98°.5.	

Name.	Formula.	Coëff. of Expansion.	Authority.
Methyl acetate.	$C_3 H_6 O_2$.	.001219574. —34°.30.	Pierre. 20.
" "	"	.001509544. 66°.26.	
" "	"	.001132859. —30°.	Pierre. 21 & 26.
" "	"	.001295954. 0°.	
" "	"	.001687434. 59°.5.	
" "	"	.001374. 0°–25°.	Kopp. 23. Second paper. Vol. given for every 5°.
" "	"	.0014838. 0°–55°.	
Ethyl "	$C_4 H_8 O_2$.	.001029108. —40°.	Pierre. 21 & 26.
" "	"	.001258496. 0°.	
" "	"	.001719623. 74°.14.	
" "	"	.0013360. 0°–25°.	Kopp. 23. Second paper. Vol. given for every 5°, from 0° to 75°.
" "	"	.0014128. 0°–50°.	
" "	"	.0015045. 0°–75°.	
" "	"	.0012941. 0°–70°.	Frankenheim. P. A. 72. 422.
Propyl "	$C_5 H_{10} O_2$.	.0013000. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Vol. given at intermediate temperatures.
" "	"	.0014610. 0°–100°.	
" "	"	.0014709. 0°–103°.	
Butyl "	$C_6 H_{12} O_2$.	.001432. 0°–50°.	Chapman & Smith. C. S. J. 22. 160.
" "	"	.0012280. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Values given for intermediate temperatures.
" "	"	.0011350. 0°–100°.	
" "	"	.0014017. 0°–116°.5.	
Amyl "	$C_7 H_{14} O_2$.	.001271. 0°–100°.	Kopp. 35. Intermediate values given.
" "	"	.0013921. 0°–140°.	
Hexyl "	$C_8 H_{16} O_2$.	.001126. 0°–50°.	Wanklyn & Erlenmeyer. J. 16. 522.
Ethyl propionate	$C_5 H_{10} O_2$.	.001510. 0°–100°.	Kopp. 35. Second paper. Intermediate values given.
" "	"	.001330. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Intermediate values given.
" "	"	.001505. 0°–100°.	
Propyl "	$C_6 H_{12} O_2$.	.001180. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Vol. given at intermediate temperatures.
" "	"	.001340. 0°–100°.	
" "	"	.001451. 0°–124°.75.	
Butyl "	$C_7 H_{14} O_2$.	.001186. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Vol. given at intermediate temperatures.
" "	"	.001302. 0°–100°.	
" "	"	.0014835. 0°–135°.7.	
Methyl butyrate.	$C_5 H_{10} O_2$.	.001239896. 0°.	Pierre. 21 & 26.
" "	"	.001776201. 102°.1.	

Name.	Formula.	Coëff. of Expansion.	Authority.
Methyl butyrate.	$C_5 H_{10} O_2$.	.0013108. 0°–50°.	Kopp. 23. Second paper. Vol. given for every 5°.
" "	"	.0014750. 0°–100°.	
Ethyl "	$C_6 H_{12} O_2$.	.001202792. 0°.	Pierre. 21 & 26.
" "	"	.001534408. 119°.	
" "	"	.0012457. 0°–40°.	Kopp. 23. Second paper. Vol. given for every 5°.
" "	"	.0013441. 0°–80°.	
" "	"	.0014552. 0°–115°.	
Propyl "	$C_7 H_{14} O_2$.	.001210. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Vol. given at intermediate temperatures.
" "	"	.001315. 0°–100°.	
" "	"	.0014237. 0°–135°.	
Butyl "	$C_8 H_{16} O_2$.	.001100. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Vol. given at intermediate temperatures.
" "	"	.001240. 0°–100°.	
" "	"	.0014007. 0°–149°.5	
Amyl "	$C_9 H_{18} O_2$.	.001100. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Intermediate values given.
" "	"	.001190. 0°–100°.	
" "	"	.0013594. 0°–170°.3.	
Methyl valerate.	$C_6 H_{12} O_2$.	.001221. 0°–50°.	Kopp. 23. Second paper. Vol. given for every 5° from 0° to 120°.
" "	"	.0013503. 0°–100°.	
" "	"	.001410. 0°–120°.	
" "	"	.001208. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Intermediate values given.
" "	"	.001334. 0°–100°.	
" "	"	.0013872. 0°–117°.5.	
Ethyl "	$C_7 H_{14} O_2$.	.001166. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Intermediate values given.
" "	"	.001295. 0°–100°.	
" "	"	.0014022. 0° 135°.5.	
Propyl "	$C_8 H_{16} O_2$.	.001100. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Vol. given at intermediate temperatures.
" "	"	.001206. 0°–100°.	
" "	"	.0014178. 0°–157°.	
Butyl "	$C_9 H_{18} O_2$.	.001064. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Vol. given at intermediate temperatures.
" "	"	.001153. 0°–100°.	
" "	"	.0012953. 0°–173°.4.	
Amyl "	$C_{10} H_{20} O_2$.	.001117. 0°–100°.	Kopp. 35. Volume given at intermediate temperatures.
" "	"	.0013247. 0°–190°.	
" "	"	.000980. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Vol. given at intermediate temperatures.
" "	"	.0011000. 0°–100°.	
" "	"	.0013079. 0°–190°.	
Butyl glycol	$C_4 H_{10} O_2$.	.00073. 0°–17°.5.	Grabowsky & Saytzeff. A. C. P. 179. 333.
Amyl "	$C_5 H_{12} O_2$.	.00077. 0°–19°.	Wagner & Saytzeff. A. C. P. 179. 309.

Name.	Formula.	Coeff. of Expansion.	Authority.
Amyl glycol.	$C_5 H_{12} O_2$.	.00076. 0°–21°.	Flavitzky. A.C.P. 179. 353
Acetic aldehyde.	$C_2 H_4 O$.	.001616. 0°–10°.	Kopp. 23. Second paper. Vol. given for every 5°.
" "	"	.001686. 0°–20°.	
" "	"	.001653523. 0°.	Pierre. 26.
" "	"	.001121090. 22°.	
Propionic "	$C_3 H_6 O$.	.001600. 0°–20°.	Pierre & Puchot. A. C. P. 155. 362.
" "	"	.001650. 0°–40°.	
" "	"	.001674. °0–46°.	
Butyric aldehyde	$C_4 H_8 O$.	.001350. 0°–20°.	Pierre & Puchot. A. C. P. 155. 362.
" "	"	.001462. 0°–40°.	
" "	"	.001606. 0°–62°.	
Valeric "	$C_5 H_{10} O$.	.001452. 0°–100°.	Kopp. 35. Intermediate values given.
" "	"	.0012625. 0°40°.	Pierre & Puchot. A. C. P. 155. 362. Intermediate values given.
" "	"	.0014454. 0°–92°. 5.	
Hexyl " β	$C_6 H_{12} O$.	.001152. 0°–50°.	Wanklyn & Erlenmeyer. J. 16. 522.
Acétone.	$C_3 H_6 O$.	.001405. 0°–20°.	Kopp. 23. Second paper. Vol. given for every 5° from 0° to 60°.
"	"	.001471. 0°–40°.	
"	"	.0015463. 0°–60°.	
Diethyl ketone.	$C_5 H_{10} O$.	.00116. 0°–19°.	Wagner & Saytzeff. A. C. P. 179. 323.
Ketone from amylene.	"	.00119.	
Oxalic acid.	$C_2H_2O_4 2H_2O$	.00027476. 0°–100°.	Playfair & Joule. 27.
Methyl oxalate.	$C_4 H_6 O_4$.	.0011560. 50°–100°.	Kopp. 35. Second paper. Intermediate values given.
" "	"	.0012683. 50°–170°.	
Ethyl "	$C_6 H_{10} O_4$.	.001200. 0°–100°.	Kopp 35. Intermediate values given.
" "	"	.0013994. 0°–190°.	
" succinate.	$C_8 H_{14} O_4$.	.001094. 0°–100°.	Kopp. 35. Second paper. Intermediate values given.
" "	"	.0013323. 0°–220°.	
Pinacolin. Synthetic.	$C_6 H_{12} O$.	.00122. 0°–50°.	Butlerow. A. C. P. 174. 127.
" From acetone.	"	.00117. 0°–50°.	
Methyl amyl pinacolin.	$C_7 H_{14} O$.	.00102. 0°–21°.	Wichnegradsky. B. D. C. G. 8. 541.
Butyl ethyl pinacolin.	"	.00109. 0°–21°.	
Ethyl amyl pinacolin.	$C_8 H_{16} O$.	.00098. 0°–21°.	

Name.	Formula.	Coëff. of Expansion.	Authority.
Ethyl carbonate.	$C_5 H_{10} O_3$.	.001322. 0°–100°.	Kopp. 35. Second paper. Intermediate values given.
" "	"	.0014054. 0°–130°.	
" cinnamate.	$C_{11} H_{12} O_2$.	.000889. 0°–100°.	Kopp. 35. Second paper. Intermediate values given.
" "	"	.0010893. 0°–270°.	
Methyl benzoate.	$C_8 H_8 O_2$.	.001005. 0°–100°.	Kopp. 35. Vol. given at intermediate temperatures.
" "	"	.001168. 0°–200°.	
Ethyl "	$C_9 H_{10} O_2$	.000975. 0°–100°.	Kopp. 35. Intermediate values given.
" "	"	.001376. 0°–210°.	
Amyl "	$C_{12} H_{16} O_2$.	.000910. 0°–100°.	Kopp. 35. Intermediate values given.
" "	"	.0011193. 0°–270°.	
Methyl homotoluylate.	$C_{10} H_{12} O_2$.	.0009286. 0°–49°.	Erlenmeyer. J. 19. 366.
Ethyl "	$C_{11} H_{14} O_2$.	.0008592. 0°–49°.	" J. 19. 367.
Amyl "	$C_{14} H_{20} O_2$.	.0006133. 0°–49°.	" "
Diethyl oxybenzoate.	$C_{11} H_{14} O_3$.	.000735.	Heintz. A. C. P. 153. 332.
Methyl salicylate	$C_8 H_8 O_3$.	.000909. 0°–100°.	Kopp. 35. Intermediate values given.
" "	"	.0010704. 0°–230°.	
Benzoic acid. L.	$C_7 H_6 O_2$.	.0009634. 121°.4–250°.	Kopp. 35.
Alpha toluic acid	$C_8 H_8 O_2$.	.000825. 83°–135°.	Möller & Streecker. J. 12. 299.
Benzoyl hydride.	$C_7 H_6 O$.	.000939. 9°–100°.	Kopp. 35. Intermediate values given.
" "	"	.0010535. 0°–180.	
Benzyl alcohol.	$C_7 H_8 O$.	.000866. 0°–100°.	Kopp. 35. Intermediate values given.
" "	"	.0010148. 0°–210°.	
Phenol.	$C_6 H_6 O$.	.000841. 0°–100°.	Kopp. 35. Second paper. Intermediate values given.
"	"	.000983. 0°–200°.	
Xylenol. L.	$C_8 H_{10} O$.	.000868. 0°–81°.	Wurtz. A. C. Phys. (4) 25. 118.
Cuminol.	$C_{10} H_{12} O$.	.000898. 0°–100°.	Kopp. 35. Intermediate values given.
"	"	.0010958. 0°–240°.	
Triethyl ether of propylphyeite.	$C_9 H_{20} O_4$.	.001129. 0°–84°.	Wolff. B. S. C. 13. 150.
Cane Sugar.	$C_{12} H_{22} O_{11}$.	.0001116. 0°–100°.	Playfair & Joule. 27.
Lactose.	$C_{12} H_{22} O_{11}$.	.00009111. "	" " "
Stearine.	$C_{57} H_{110} O_6$.	.0008433. 0°–90°.	Kopp. A. C. P. 93. 129. Vol given for every 10°.
"	"	.04963. In melting at 60°.	

Name.	Formula.	Coëff. of Expansion.	Authority.
Beeswax.		.000637. 10°–25°.7.	Kopp. A. C. P. 93. 129.
«		.001098. 25°.7–30°.8	
«		.001439. 30°.8–43°.1	
«		.004558. 43°.1–47°.1	
«		.000743. 10°–25°.7.	Two series of determinations.
«		.000772. 25°.7–30°.8	
«		.001478. 30°.8–43°.1	
«		.004578. 43°.1–47°.1	
«	———	.00422. In melting at 64°.	
Olive Oil.		.000803. 0°–100°.	Kopp. A. C. P. 93. 129. Vol. given for every 5°.
« «		.0008242. 0°–120°.	
« «		.000629.	Stillwell. Am. Chem. 1. 408.
Almond Oil.	———	.000787. 0°–100°.	Muncke. 8. Vol. given for every 5°
« «		.000794. 0°–120°.	

XIV. Compounds Consisting of C, H, N; or C, H, N, O.

Name.	Formula.	Coëff. of Expansion.	Authority.
Methyl cyanide.	$C H_3 . C N$.	.00145125. 0°–80°.	Kopp. 35. Third paper. Intermediate values given.
Isobutyl «	$C_4 H_9 . C N$.	.0011380. 0°–50°.	Erlenmeyer & Hell. A. C. P. 160. 257. Intermediate values given.
« «	«	.0012439. 0°–100°.	
« «	«	.0012577. 0°–120°.	
Allyl «	$C_3 H_5 . C N$.	.0014315. 0°–95°.	Lieke. A. C. P. 112. 319.
Phenyl «	$C_6 H_5 C N$.	.000961. 0°–100°.	Kopp. 35. Third paper. Intermediate values given.
« «	«	.0011045. 0°–200°.	
Aniline, or phenylamine.	$C_6 H_7 N$.	.000915. 0°–100°.	Kopp. 35. Third paper. Intermediate values given.
« «	«	.0010147. 0°–190°.	
Coniine. Natural.	$C_8 H_{15} N$.	.001011. 0°–90°.	Schiff. A. C. Phys. (5). 1. 143.
« Artificial.	«	.0009333. «	
Ethyl nitrate.	$C_2 H_5 . N O_3$.	.0014111. 0°–90°.	Kopp. 35. Third paper. Intermediate values given.

Name.	Formula.	Coëff. of Expansion.	Authority.
Butyl nitrate.	$C_4 H_9 . N O_3$.	.001666. 0°–50°.	Chapman & Smith. C. S. J. 22. 153.
Nitrobenzol.	$C_6 H_5 N O_2$.	.000892. 0°–100°.	Kopp. 35. Third paper. Intermediate values given.
"	"	.0010082. 0°–220°.	

XV. Chlorinated Organic Compounds.

Name.	Formula.	Coëff. of Expansion.	Authority.
Ethyl chloride.	$C_2 H_5 Cl$.	.001435355. —31°.63.	Pierre. 20.
" "	"	.001660556. 26°.41.	
" "	"	.001574578. 0°.	Pierre. 26.
" "	"	.001642177. 11°.	
" "	"	.001482. 0°.	Drion. A. C. Phys. (3). 56. 5. Value given for every 10°.
" "	"	.002045. 50°.	
" "	"	.003250. 100°.	
" "	"	.005031. 130°.	
Propyl "	$C_3 H_7 Cl$.	.0013888. 0°–25°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Intermediate values given.
" "	"	.0014645. 0°–46°.5.	
Butyl "	$C_4 H_9 Cl$.	.0013360. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Intermediate values given.
" "	"	.0014217. 0°–69°.	
Amyl "	$C_5 H_{11} Cl$.	.001173742. 0°.	Pierre. 26.
" "	"	.001362651. 101°.75.	
" "	"	.001171550. 0°.	Pierre. 30.
" "	"	.001693327. 101°.75.	
Diethyl carbinol chloride.	"	.00111. 0°–21°.	Wagner & Saytzeff. A. C. P. 179. 321.
Amylene hydrochlorate.	"	.00113.	
Methylene chloride.	$C H_2 Cl_2$.	.00137. 0°–20°.	Butlerow. J. 22. 343.
Ethylene "	$C_2 H_4 Cl_2$.	.001084043. -30°.	Pierre. 24.
" "	"	.001118932. 0°.	
" "	"	.001530055. 84°.92.	
Butylene "	$C_4 H_8 Cl_2$.	.0011940. 0°–100°.	Kopp. 35. Second paper. Intermediate values given.
" "	"	.0012392. 0°–130°.	
Chloroform.	$C H Cl_3$.	.001107146. 0°.	Pierre. 26.
"	"	.001488703. 63°.5.	

Name.	Formula.	Coëff. of Expansion.	Authority.
Chloroform.	C H Cl_3.	.001488689. 63°.5.	Pierre. 30.
Chlorinated ethyl chloride.	C_2 H_4 Cl_2.	.001290718. 0°.	Pierre. 26 & 29.
« « «	«	.001544953. 64°.8.	
Dichlorinated « «	C_2 H_3 Cl_3.	.001174820. 0°.	Pierre. 26 & 29.
« « «	«	.001611246. 74°.9.	
Chlorinated ethylene chloride.	C_2 H_3 Cl_3.	.001056414. 0°.	Pierre. 29.
« « «	«	.001399361. 100°.	
« « «	«	.001431592. 114°.2.	Pierre. 26.
Dichlorinated « «	C_2 H_2 Cl_4.	.000835620. 0°.	Pierre. 30.
« « «	«	.001335024. 138°.6.	
Pentachloro dimethyl.	C_2 H Cl_5.	.000899044. 0°.	Pierre. 30.
« «	«	.001452752. 153°.8.	
Monochloro benzol.	C_6 H_5 Cl.	.00116.	Jungfleisch. J. 21. 343.
Trichlorobenzol. L.	C_6 H_3 Cl_3.	.000989.	« J. 21. 350.
Chloral.	C_2 H Cl_3 O.	.001298. 0°–100°.	Kopp. 35. Second paper. Intermediate values given.
Acetyl chloride.	C_2 H_3 Cl O.	.0015167. 0°–60°.	Kopp. 35. Second paper. Intermediate values given.
Epichlorhydrin.	C_3 H_5 Cl O.	.0006996. 0°–50°.	Darmstædter. J. 21. 454.
Benzoyl chloride.	C_7 H_5 Cl O.	.000930. 0°–100°.	Kopp. 35. Second paper. Intermediate values given.
« «	«	.001056. 0°–200°.	

XVI. Brominated Organic Compounds.

Name.	Formula.	Coëff. of Expansion.	Authority.
Methyl bromide.	$C H_3 Br.$	.001408318. −34°.64.	Pierre. 20.
" "	"	.001576164. 27°.76.	
" "	"	.001415206. 0°.	Pierre. 21 & 26.
" "	"	.001559038. 13°.	
Ethyl "	$C_2 H_5 Br.$	.001265548. −31°.87.	Pierre. 20.
" "	"	.001490748. 53°.66.	
" "	"	.001290277. −30°.	
" "	"	.001337628. 0°.	Pierre. 21 & 26.
" "	"	.001540060. 40°.7.	
Propyl "	$C_3 H_7 Br.$	.001318. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Intermediate values given.
" "	"	.001393. 0°–72°.	
Butyl "	$C_4 H_9 Br.$	.001234. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Intermediate values given.
" "	"	.001325. 0°–90°.5.	
Amyl "	$C_5 H_{11} Br.$	.001023212. 0°.	Pierre. 26.
" "	"	.001602729. 118°.7.	
" "	"	.001596728. 118°.7.	Pierre. 30.
Ethylene "	$C_2 H_4 Br_2.$	.000952696. 20°.09.	
" "	"	.001182181. 100°	Pierre. 24 & 26.
" "	"	.001453206. 132°.6.	
Propylene "	$C_3 H_6 Br_2.$	.001785. 0°–20°.	Friedel & Ladenburg. B. S. C. 8. 146. Prepared by two processes.
" "	"	.001805. "	
Methylbromacetol.	"	.001620. 0°–20°.	Friedel & Ladenburg. B. S. C. 8. 150.
Butylene bromide.	$C_4 H_8 Br_2.$	.00082. 0°–20°.	Grabowsky & Saytzeff. A. C. P. 179. 332.
Amylene "	$C_5 H_{10} Br_2.$	.00093. 0°–14°.	Wagner & Saytzeff. A. C. P. 179. 308.
Allyl bromide.	$C_3 H_5 Br.$	.0007136. 0°–15°.	Tollens. J. F. P. 107. 185.
" "	"	.0011848. 15°–62°.	
Bromodichlorhydrin of propyl phycite.	$C_3H_5BrCl_2O.$	.000782. 3°.1–17°.5.	Wolff. B. S. C. 13. 150.
" "	"	.000869. 17°.5–36°.	
" "	"	.000894. 36°–53°.	
" "	"	.000899. 86°–100°.5.	
" "	"	.000895. 3°.1–100°.5.	

XVII. Organic Iodine Compounds.

Name.	Formula.	Coëff. of Expansion.	Authority.
Methyl iodide.	CH_3I.	.001150866. −35°.43.	Pierre. 20.
" "	"	.001360369. 61°.52.	
" "	"	.001085098. −35°.	Pierre. 21.
" "	"	.001199591. 0°.	
" "	"	.001446938. 43°.8.	
Ethyl "	C_2H_5I.	.001074754. 34°.81.	Pierre. 20.
" "	"	.001264140. 71°.86.	
" "	"	.001018046. −30°.	Pierre. 21.
" "	"	.001142251. 0°.	
" "	"	.001480311. 70°.	
Propyl "	C_3H_7I.	.001120. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Vol. given at intermediate temperatures.
" "	"	.001250. 0°–100°.	
" "	"	.0012631. 0°–104°.5.	
Butyl "	C_4H_9I.	.001078. 0°–50°.	Pierre & Puchot. A. C. Phys. (4). 22. 234. Vol. given at intermediate temperatures.
" "	"	.001166. 0°–100°.	
" "	"	.0012082. 0°–122°.5.	
" "	"	.00106182. 0°–50°.	De Luynes. J. 17. 499. Vol. given for every 10°.
" "	"	.00112499. 0°–90°.	
Isobutyl "	"	.0010666. 0°–50°.	Erlenmeyer & Hell. A. C. P. 160. 257. Intermediate values given.
" "	"	.0011601. 0°–100°.	
" "	"	.0011903. 0°–120°.	
Amyl "	$C_5H_{11}I$.	.001112. 0°–100°.	Kopp. 35. Second paper. Intermediate values given.
" "	"	.001204. 0°–150°.	
Diethyl carbinol iodide.	"	.00089. 0°–20°.	Wagner & Saytzeff. A. C. P. 179. 318.
Amylene hydriodate.	"	.00097. 0°–20°.	
Hexyl iodide. β.	$C_6H_{13}I$.	.00092. 0°–50°.	Wanklyn & Erlenmeyer. J. 16. 518.
Methylene "	CH_2I_2.	.0008316. a. 5°–95°.	Butlerow. J. 11. 420.

XVIII. Organic Compounds Containing Sulphur.

Name.	Formula.	Coëff. of Expansion.	Authority.
Ethyl sulphide.	$C_4 H_{10} S$.	.001196426. 0°.	Pierre. 26.
" "	"	.001721026. 91°.	
Methyl disulphide.	$C_2 H_6 S_2$.	.001017049. 0°.	Pierre. 26.
" "	"	.001440298. 112°.1.	
" "	"	.000941822. 0°.	Pierre. 30.
Amyl mercaptan	$C_5 H_{12} S$.	.001220. 0°–100°.	Kopp. 35. Second paper. Intermediate values given.
" "	"	.0012617. 0°–120°.	
Ethyl sulphite.	$C_4 H_{10} S O_3$.	.000990479. 0°.	
" "	"	.001257739. 100°.	Pierre. 25.
" "	"	.001461725. 160°.3.	
" "	"	.0011110. 0°–100°.	Carius. J. F. P. (2). 2. 279.
" "	"	.0012486. 0°–161°.3.	Other values given.
" ethylsulphonate.	$C_4 H_{10} S O_3$.	.0009580. 0°–100°.	Carius. J. F. P. (2). 2. 279.
" "	"	.0011265. 0°–213°.4.	Other values given.
Methyl sulphocyanide.	$C H_3 C N S$.	.000970072. 0°.	Pierre. 26 & 30.
" "	"	.001494627. 132°.86.	
Allyl "	$C_3 H_5 C N S$.	.0011480. 0°–100°.	Kopp. 35. Third paper. Intermediate values given.
" "	"	.0012413. 0°–150°.	
Chlorosulphuric ether.	$C_2 H_5 Cl S O_3$.	.0006393. 0°–27°.	Purgold. J. 21. 416.
"	"	.0007155. 27°–61°.	

XIX. Metallic Salts of Organic Acids.

Name.	Formula.	Coëff. of Expansion.	Authority.
Potassium oxalate.	$K_2 C_2 O_4 . H_2 O$.	.0001162. 0°–100°.	Playfair & Joule. 27.
Ammonium "	$Am_2 C_2 O_4 . H_2 O$.	.0000876. "	" " "

Name.	Formula.	Coëff. of Expansion.	Authority.
Potassium binoxalate.	KHC_2O_4.	.00011338. 0°–100°.	Playfair & Joule. 27.
Ammonium "	$AmHC_2O_4.H_2O$.	.00013718. "	" " "
Potassium quadroxalate.	$KH_3C_4O_8.2H_2O$	.0015916. "	" " "
Ammonium "	$AmH_3C_4O_8.H_2O$	.00014347. "	" " "

XX. Miscellaneous Organic Compounds.

Name.	Formula.	Coëff. of Expansion.	Authority.
Lead tetramethyl.	$(CH_3)_4Pb$.	.004137. 0°–100°.	Butlerow. J. 16. 476.

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