

Thermal conductivity of liquids: Aromatic hydrocarbons

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THERMAL CONDUCTIVITY OF LIQUIDS: AROMATIC HYDROCARBONS

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Data sheets for each of the liquids are given in the following order:

Formula	Name	Alternative Name(s)	
C₆ and C₇ ALKYL BENZENES			
1. C ₆ H ₆	Benzene		7
2. C ₆ H ₅ CH ₃	Toluene	Methylbenzene Phenylmethane	10
C₈ ALKYL BENZENES			
3. C ₆ H ₅ CH ₂ CH ₃	Ethylbenzene	Phenylethane	15
4. 1,2-(CH ₃) ₂ C ₆ H ₄	1,2-Dimethylbenzene	2-Methyltoluene <i>o</i> -Xylene	17
5. 1,3-(CH ₃) ₂ C ₆ H ₄	1,3-Dimethylbenzene	3-Methyltoluene <i>m</i> -Xylene	19
6. 1,4-(CH ₃) ₂ C ₆ H ₄	1,4-Dimethylbenzene	4-Methyltoluene <i>p</i> -Xylene	21
7. (CH ₃) ₂ C ₆ H ₄	Xylene - mixed isomers	Xylol	23

Formula	Name	Alternative Name(s)	
C₉ ALKYL BENZENES			
8. C ₆ H ₅ [CH ₂] ₂ CH ₃	Propylbenzene	1-Phenylpropane <i>n</i> -Propylbenzene	24
9. C ₆ H ₅ CH(CH ₃) ₂	Isopropylbenzene	2-Phenylpropane (1-Methylethyl)benzene Cumene	26
10. 1,2,3-(CH ₃) ₃ C ₆ H ₃	1,2,3-Trimethylbenzene	Hemimellitene	28
11. 1,2,4-(CH ₃) ₃ C ₆ H ₃	1,2,4-Trimethylbenzene	Pseudocumene	29
12. 1,3,5-(CH ₃) ₃ C ₆ H ₃	1,3,5-Trimethylbenzene	Mesitylene	30
C₁₀ ALKYL BENZENES			
13. C ₆ H ₅ [CH ₂] ₃ CH ₃	Butylbenzene	1-Phenylbutane <i>n</i> -Butylbenzene	31
14. C ₆ H ₅ CH(CH ₃)CH ₂ CH ₃	<i>sec</i> -Butylbenzene	2-Phenylbutane (1-Methylpropyl)benzene	33
15. C ₆ H ₅ CH ₂ CH(CH ₃) ₂	Isobutylbenzene	1-Phenyl-2-methylpropane (2-Methylpropyl)benzene	34
16. C ₆ H ₅ C(CH ₃) ₃	<i>tert</i> -Butylbenzene	2-Phenyl-2-methylpropane (1,1-Dimethylethyl)benzene	35
17. 1,4-H ₃ CC ₆ H ₄ CH(CH ₃) ₂	1-Methyl-4-isopropylbenzene	4-Isopropyltoluene 1-Methyl-4-(1-methylethyl)benzene <i>p</i> -Cymene	36
18. 1,2,4,5-(CH ₃) ₄ C ₆ H ₂	1,2,4,5-Tetramethylbenzene	Durene	37
C₁₁ ALKYL BENZENES			
19. C ₆ H ₅ [CH ₂] ₄ CH ₃	Pentylbenzene	1-Phenylpentane <i>n</i> -Pentylbenzene	38
20. (CH ₃) ₅ C ₆ H	Pentamethylbenzene		39
C₁₂ ALKYL BENZENES			
21. C ₆ H ₅ [CH ₂] ₅ CH ₃	Hexylbenzene	1-Phenylhexane <i>n</i> -Hexylbenzene	40
22. (CH ₃ CH ₂) ₃ C ₆ H ₃	Triethylbenzene-mixed isomers		41
23. (CH ₃) ₆ C ₆	Hexamethylbenzene	Mellitene	42
ALKENYL and CYCLOALKYL BENZENES			
24. H ₂ C=CH(C ₆ H ₅)	Styrene	Vinylbenzene Ethenylbenzene Phenylethene	43
25. C ₆ H ₅ C ₆ H ₁₁	Phenylcyclohexane	Cyclohexylbenzene	44

Formula	Name	Alternative Name(s)	
POLYPHENYL HYDROCARBONS			
26. $C_6H_5C_6H_5$	Biphenyl	Diphenyl Phenylbenzene	45
27. $1,2-(C_6H_5)_2C_6H_4$	<i>o</i> -Terphenyl	1,2-Diphenylbenzene 2-Phenylbiphenyl 1,1':2',1''-Terphenyl	47
28. $1,3-(C_6H_5)_2C_6H_4$	<i>m</i> -Terphenyl	1,3-Diphenylbenzene 3-Phenylbiphenyl 1,1':3',1''-Terphenyl	49
29. $1,4-(C_6H_5)_2C_6H_4$	<i>p</i> -Terphenyl	1,4-Diphenylbenzene 4-Phenylbiphenyl 1,1':4',1''-Terphenyl	51
30. $4-(CH_3)_2HCC_6H_4C_6H_5$	4-Isopropylbiphenyl	4-Isopropyldiphenyl 1-Isopropyl-4-phenylbenzene 1-Phenyl-4-isopropylbenzene 1-(1-Methylethyl)-4-phenylbenzene 4-(1-Methylethyl)biphenyl	52
FUSED RING HYDROCARBONS			
31. <i>cis</i> - $C_{10}H_{10}(CH_2)_4$	<i>cis</i> -Decahydronaphthalene	<i>cis</i> -Decalin <i>cis</i> -Bicyclo[4.4.0]decane	54
32. <i>trans</i> - $C_{10}H_{10}(CH_2)_4$	<i>trans</i> -Decahydronaphthalene	<i>trans</i> -Decalin <i>trans</i> -Bicyclo[4.4.0]decane	56
33. $C_{10}H_8$	Naphthalene		58
34. $C_{14}H_{10}$	Anthracene		59
35. $C_{14}H_{10}$	Phenanthrene		60
36. $C_{16}H_{10}$	Pyrene	Benzo[d,e,f]phenanthrene	61
37. $C_6H_4(CH_2)_3$	Indane	Indan 2,3-Dihydroindene 1,2-Propanobenzene	62
38. $C_6H_4(CH_2)_4$	1,2,3,4-Tetrahydronaphthalene	Tetralin 1,2-Butanobenzene	63
39. $C_{10}H_6(CH_2)_2$	Acenaphthene	1,8-Ethylenenaphthalene 1,8-Ethanonaphthalene 1,2-Dihydroacenaphthylene	64
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THERMAL CONDUCTIVITY OF LIQUIDS: AROMATIC HYDROCARBONS

1. INTRODUCTION

This Item presents values of thermal conductivity at saturation pressure, in tabular form, for liquid aromatic and fused ring hydrocarbons which are members of the following groups:

- (a) alkyl- and alkenylbenzenes,
- (b) cycloalkylbenzenes,
- (c) polyphenyl hydrocarbons and
- (d) fused ring hydrocarbons.

The data on which these recommended values of thermal conductivity are based are the most reliable available and the temperature range covered is from the melting temperature to approximately 0.9 of the critical temperature. Quantities are expressed in SI units and conversion factors to other units are provided in Section 3.

Section 4 describes the procedure used to obtain the values of thermal conductivity presented and indicates the effect of pressure. Section 5 gives an explanation of the Tables and indicates the uncertainties in the values presented in them.

References to sources of supplementary information are given in Section 6. The data sources for each particular compound are listed on the appropriate data sheet.

2. NOTATION AND UNITS

The SI unit of thermal conductivity is the watt per metre kelvin (W/m K). A convenient submultiple SI unit for the range of thermal conductivity in this Item is the milliwatt per metre kelvin (mW/m K); hence that is the unit adopted here.

A	constant for each liquid in Equation (4.2)	mW/m K
A'	constant for each liquid in Equation (4.1)	mW/m K
B'	non-dimensional constant for each liquid in Equation (4.1)	—
B, C, D	non-dimensional constants for each liquid in Equation (4.2)	—
p	pressure	N/m ² (Pa)
T	kelvin temperature	K
t	Celsius temperature, $T - 273.15$	°C
λ	thermal conductivity	mW/m K

Subscripts

c	denotes value at the critical point
m	denotes value at the melting point
p	denotes value at pressure p
r	denotes reduced quantity, <i>e.g.</i> $T_r = T/T_c$.

3. CONVERSION FACTORS

1 mW/m K	= 0.8598×10^{-3} kcal/m h °C*
	= 2.3885×10^{-6} cal/cm s °C*
	= 0.5778×10^{-3} Chu/ft h °C*
	= 0.5778×10^{-3} Btu/ft h °F*
	= 6.9335×10^{-3} Btu in/ft ² h °F*
10^5 N/m ²	= 1 bar
	= 14.5038 lbf/in ²
	= 1.0197 kgf/cm ²
	= 0.9869 atm
	= 750.062 mmHg.

* The values used for the calorie and British Thermal Unit are International Table values.

4. THERMAL CONDUCTIVITY

4.1 Thermal Conductivity at Saturation Pressure

In Reference 2 Riedel showed that the experimental data for the thermal conductivity of normal (that is unassociated) liquids along the saturation line could be represented by the equation:

$$\lambda = A'[1 + (20/3)(1 - T_r)^{2/3}].$$

For the liquids considered in this Item a better representation of the data is obtained, over a wide temperature range, from the modified equation:

$$\lambda = A'[1 + B'(1 - T_r)^{2/3}]. \quad (4.1)$$

The range of applicability of Equation (4.1) is limited for most compounds; recent data from several sources show that there may be marked deviations in the regions of the triple point and the critical point from extrapolations of Equation (4.1) fitted in the intermediate region.

For the liquids considered in this Item a good representation of the data* between the melting temperature

* Experimental data at temperatures below the normal boiling temperature, t_b are often at 1 atm pressure. As indicated in Section 4.2 the difference between values of λ at 1 atm pressure and at saturation pressure below t_b is not significant.

and $T_r = 0.9$ is obtained from the equation:

$$\lambda = A[1 + B(1 - T_r)^{1/3} + C(1 - T_r)^{2/3} + D(1 - T_r)]. \quad (4.2)$$

For a few liquids in this Item, experimental data show slight deviations from Equation (4.2) at low temperatures and the tabulated values follow the correlation. The deviation from the equation is however, generally less than 5 per cent.

Measurements of thermal conductivity have been made for relatively few liquids at $T_r > 0.9$ and so, because of the uncertain variation of thermal conductivity in the critical region, data are presented only for temperatures up to $T_r = 0.9$. The equation extrapolates in a physically realistic manner to within a few kelvin of the critical point.

The critical temperatures for these compounds have been taken from ESDU 86012 (Reference 8), the literature or were estimated. In this Item, the critical temperatures should be regarded as correlating parameters only and should not be taken as a source of accurate values.

The derived values of A , B , C and D given in Table 7.1 are a correlated set of values giving the best fit to the experimental data, not only as individual compounds but also as members of their chemical series. This method of correlating data for a series of compounds has been described in References 5 and 6. For all the compounds in this Item, it was found that C and D are directly related to B^* , as was observed for other non-hydrogen-bonded compounds such as the alkanes. Correlated values of the constants A , B , C and D were used to estimate constants for liquids for which no experimental data exist. Using these values with the values of T_c given in Table 7.1, values of λ in mW/m K have been calculated for each compound from Equation (4.2) and are presented in the data sheets.

4.2 Effect of Pressure

At temperatures up to the normal boiling point, the effect of pressure from the saturation pressure to $50 \times 10^5 \text{ N/m}^2$ (up to 50 atm) is to increase the thermal conductivity by approximately 1 per cent and, for most practical purposes, values at saturation pressure may be taken as equal to those at atmospheric pressure.

Reference 1 gives measurements of thermal conductivity for a number of liquids up to $12\,000 \times 10^5 \text{ N/m}^2$ ($\approx 12\,000 \text{ atm}$) at 30°C and 75°C . A generalised correlation of these results is given in Reference 3, but a knowledge of the critical pressure of the substance is required for its use.

For pressures up to $500 \times 10^5 \text{ N/m}^2$ ($\approx 500 \text{ atm}$) between the melting temperature and the normal boiling point a very approximate relationship:

$$\lambda_p/\lambda \approx 1 + 0.2p \times 10^{-8}, \quad (4.3)$$

may be used where λ_p is the thermal conductivity at pressure p and λ is the thermal conductivity at a pressure of 10^5 N/m^2 ($\approx 1 \text{ atm}$), both at the same temperature.

* $C = 1 - 3B$ and $D = 3B$.

5. EXPLANATION OF TABLES

5.1 Notes on Compounds Considered

The values of T_m , the first entry in the individual data sheets were taken from the literature or estimated. Compounds for which no experimental data exist and for which A , B , C and D were estimated as described in Section 4.1 are indicated by an asterisk against the compound number in Table 7.1. In general only pure compounds are considered here. However, two substances, xylene (mixed isomers) and triethylbenzene (mixed isomers) are included as they are standard commercial products, usually not containing more than about 60-70 per cent of the main constituent. Some experimental data at lower temperatures exist for the mixed isomers of xylene but as they are about 1.5 per cent higher than the data given here for any of the constituent isomers, and as there are no high temperature data, the user is advised to use the data for 1,3-dimethylbenzene (*m*-xylene).

Some experimental data also exist for a particular mixture of terphenyl isomers, (Reference 4), but, because of the special nature of the mixture, data have not been included in this Data Item. Although not an aromatic hydrocarbon, decahydronaphthalene (decalin) is included as a derivative of naphthalene.

The constants of Equation (4.2) are given in Table 7.1 and on the data sheets. Values of the thermal conductivity are given in the data sheets at 10 kelvin intervals in K and °C from either the melting temperature, or an appropriate starting temperature where the melting temperature is unknown, to a temperature corresponding with $T_r \approx 0.9$. The sources are given in the data sheets and extrapolated values are indicated in parentheses.

5.2 Accuracy of the Data

For uniformity and ease of interpolation the data are presented and can be read to more significant digits than is warranted by their estimated accuracy.

The experimental data from the most reliable individual sources have a repeatability of about ± 1 per cent although differences in technique used by different workers (and possibly also in the purity of samples) can increase the uncertainty in the absolute values to about ± 2 per cent. However, such reliable data are not available for all the compounds considered, nor over the whole temperature range covered. Although it is considered that the correlation procedures adopted keep the errors in the values presented to a minimum, the user should in general allow for an uncertainty of ± 5 per cent unless the value in the data sheet is truncated to a whole number. Where whole numbers are given the uncertainty increases to ± 10 per cent.

For a few of these liquids the experimental data are more reliable and an accuracy of ± 2 per cent applies over part of the temperature range. The following liquids, within the quoted temperature range, justify this higher accuracy of ± 2 per cent:

benzene	between	5.5 °C	and	150 °C
toluene	between	50 °C	and	150 °C
ethylbenzene	between	0 °C	and	100 °C
biphenyl	between	100 °C	and	200 °C.

Some fluids have poor thermal stability coupled with a high critical temperature. Values have been tabulated for all fluids up to $T_r \approx 0.9$ but many of these fluids will decompose at elevated temperatures. As most compounds will decompose rapidly at temperatures above about 300 °C, uncertainties of greater than ± 10 per cent may occur for temperatures ≥ 573 K.

The structural formulae of all the compounds in this Item are given in Appendix A.

6. REFERENCES

The references given are recommended sources of information supplementary to that in this Item.

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7. TABLES

TABLE 7.1 Constants for Equation (4.2)

Compound	T_c	A	B	C	D	Range of Applicability °C
	K	mW/m K				
1. Benzene	562.16	54.038	2.8	-7.4	8.4	5.5 to 240
2. Toluene	591.80	51.557	2.2	-5.6	6.6	-95.0 to 260
3. Ethylbenzene	617.20	53.395	1.8	-4.4	5.4	-95.0 to 290
4. 1,2-Dimethylbenzene	630.33	54.349	1.8	-4.4	5.4	-25.2 to 300
5. 1,3-Dimethylbenzene	617.05	54.826	1.8	-4.4	5.4	-48.2 to 290
6. 1,4-Dimethylbenzene	616.23	54.530	1.8	-4.4	5.4	12.9 to 290
7. Xylene - mixed isomers	617.05	54.826	1.8	-4.4	5.4	-48.2 to 290
8. Propylbenzene	638.32	53.784	1.6	-3.8	4.8	-100.1 to 310
9. Isopropylbenzene	631.13	51.573	1.6	-3.8	4.8	-96.1 to 300
10. 1,2,3-Trimethylbenzene	664.47	55.012	1.6	-3.8	4.8	-25.2 to 330
11. 1,2,4-Trimethylbenzene	649.17	55.012	1.6	-3.8	4.8	-44.2 to 320
12. 1,3,5-Trimethylbenzene	637.25	57.468	1.6	-3.8	4.8	-45.2 to 310
13. Butylbenzene	660.48	55.209	1.4	-3.2	4.2	-88.1 to 330
14. <i>sec</i> -Butylbenzene	648.	52.677	1.4	-3.2	4.2	-75.1 to 320
15.* Isobutylbenzene	548.	53.120	1.4	-3.2	4.2	-51.2 to 230
16.* <i>tert</i> -Butylbenzene	638.	52.170	1.4	-3.2	4.2	-58.2 to 310
17. 1-Methyl-4-isopropylbenzene	651.	53.690	1.4	-3.2	4.2	-68.1 to 320
18. 1,2,4,5-Tetramethylbenzene	678.	59.261	1.4	-3.2	4.2	78.9 to 340
19. Pentylbenzene	678.85	58.980	1.1	-2.3	3.3	-75. to 340
20. Pentamethylbenzene	719.	58.557	1.2	-2.6	3.6	53. to 380
21. Hexylbenzene	695.35	58.190	1.1	-2.3	3.3	-61. to 360
22. Triethylbenzene - mixed isomers	677.15	58.980	1.1	-2.3	3.3	0. to 340
23. Hexamethylbenzene	758.	60.047	1.1	-2.3	3.3	166. to 410
24. Styrene	647.55	55.302	1.8	-4.4	5.4	-31.2 to 310
25. Phenylcyclohexane	690.65	59.8	0.8	-1.4	2.4	5. to 350
26. Biphenyl	769.15	64.6	1.0	-2.0	3.0	69. to 420
27. <i>o</i> -Terphenyl	891.	65.4	0.5	-0.5	1.5	57. to 530
28. <i>m</i> -Terphenyl	924.9	70.1	0.5	-0.5	1.5	87. to 560
29. <i>p</i> -Terphenyl	926.	70.1	0.5	-0.5	1.5	213. to 570
30. 4-Isopropylbiphenyl	810.15	56.4	0.9	-1.7	2.7	20. to 460
31. <i>cis</i> -Decahydronaphthalene	702.25	68.054	0	1.0	0	-43. to 360
32. <i>trans</i> -Decahydronaphthalene	687.05	68.054	0	1.0	0	-30.4 to 350
33. Naphthalene	748.4	74.7	0.5	-0.5	1.5	80. to 410
34. Anthracene	869.3	79.721	0	1.0	0	215. to 510
35. Phenanthrene	873.	77.128	0	1.0	0	99. to 520
36. Pyrene	877.15	75.832	0	1.0	0	151. to 520
37. Indane	684.9	53.538	1.6	-3.8	4.8	-51.4 to 350
38. 1,2,3,4-Tetrahydronaphthalene	728.15	75.710	0	1.0	0	-36. to 390
39. Acenaphthene	745.75	79.721	0	1.0	0	95. to 400

* An asterisk against the compound number indicates that no experimental data were found and the constants A, B, C and D were estimated.

C₆H₆ BENZENE

$$\lambda = A[1 + B(1 - T_r)^{1/3} + C(1 - T_r)^{2/3} + D(1 - T_r)]$$

where

λ = thermal conductivity at saturation pressure (mW/m K)

$$T_r = T/T_c, \quad T = \text{temperature (K)}$$

$$T_c = 562.16 \text{ K}$$

$$A = 54.038, \quad B = 2.8, \quad C = -7.4, \quad D = 8.4$$

T K	λ mW/m K	T K	λ mW/m K	t °C	λ mW/m K	t °C	λ mW/m K
278.65	150.0	400	110.4	5.5	150.0	130	109.4
280	149.6	410	107.5	10	148.5	140	106.5
290	146.1	420	104.6	20	145.0	150	103.7
300	142.6	430	101.8	30	141.5	160	101.0
310	139.1	440	99.1	40	138.1	170	98.3
320	135.8	450	96.5	50	134.7	180	95.7
330	132.4	460	93.9	60	131.4	190	93.2
340	129.1	470	91.5	70	128.1	200	90.7
350	125.9	480	89.1	80	124.8	210	88.4
360	122.7	490	86.9	90	121.7	220	86.2
370	119.5	500	84.7	100	118.5	230	84.1
380	116.4	510	82.7	110	115.4	240	82.1
390	113.4			120	112.4		

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$C_6H_5CH_3$ TOLUENE (METHYLBENZENE, PHENYLMETHANE)

$$\lambda = A[1 + B(1 - T_r)^{1/3} + C(1 - T_r)^{2/3} + D(1 - T_r)]$$

where

λ = thermal conductivity at saturation pressure (mW/m K)

$T_r = T/T_c$, T = temperature (K)

$T_c = 591.80$ K

$A = 51.557$, $B = 2.2$, $C = -5.6$, $D = 6.6$

T K	λ mW/m K	T K	λ mW/m K	t °C	λ mW/m K	t °C	λ mW/m K
178.15	162.7	360	113.3	-95.0	162.7	90	112.5
180	162.1	370	110.8	-90	161.2	100	110.0
190	159.2	380	108.3	-80	158.3	110	107.6
200	156.4	390	105.9	-70	155.5	120	105.2
210	153.5	400	103.5	-60	152.6	130	102.8
220	150.7	410	101.2	-50	149.8	140	100.4
230	147.9	420	98.9	-40	147.0	150	98.1
240	145.1	430	96.6	-30	144.2	160	95.9
250	142.3	440	94.4	-20	141.4	170	93.7
260	139.6	450	92.2	-10	138.7	180	91.5
270	136.8	460	90.0	0	136.0	190	89.3
280	134.1	470	87.9	10	133.3	200	87.3
290	131.4	480	85.9	20	130.6	210	85.2
300	128.7	490	83.9	30	127.9	220	83.3
310	126.1	500	81.9	40	125.3	230	81.3
320	123.5	510	80.1	50	122.7	240	79.5
330	120.9	520	78.2	60	120.1	250	77.7
340	118.3	530	76.	70	117.5	260	76.
350	115.8			80	115.0		

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$C_6H_5CH_2CH_3$ ETHYLBENZENE (PHENYLETHANE)

$$\lambda = A[1 + B(1 - T_r)^{1/3} + C(1 - T_r)^{2/3} + D(1 - T_r)]$$

where

λ = thermal conductivity at saturation pressure (mW/m K)

$$T_r = T/T_c, \quad T = \text{temperature (K)}$$

$$T_c = 617.20 \text{ K}$$

$$A = 53.395, \quad B = 1.8, \quad C = -4.4, \quad D = 5.4$$

T K	λ mW/m K	T K	λ mW/m K	t °C	λ mW/m K	t °C	λ mW/m K
178.15	(157.1)	370	112.1	-95.0	(157.1)	100	111.4
180	(156.6)	380	109.9	-90	(155.8)	110	109.2
190	(154.2)	390	107.7	-80	153.4	120	107.1
200	151.7	400	105.6	-70	150.9	130	104.9
210	149.2	410	103.5	-60	148.5	140	102.8
220	146.8	420	101.4	-50	146.0	150	100.8
230	144.4	430	99.4	-40	143.6	160	98.7
240	142.0	440	97.3	-30	141.2	170	96.7
250	139.6	450	95.3	-20	138.8	180	94.7
260	137.2	460	93.4	-10	136.5	190	92.7
270	134.8	470	91.4	0	134.1	200	90.8
280	132.5	480	89.5	10	131.7	210	88.9
290	130.1	490	87.6	20	129.4	220	87.0
300	127.8	500	85.8	30	127.1	230	85.2
310	125.5	510	84.0	40	124.8	240	83.4
320	123.2	520	82.2	50	122.5	250	81.6
330	121.0	530	80.	60	120.3	260	80.
340	118.7	540	79.	70	118.0	270	78.
350	116.5	550	77.	80	115.8	280	77.
360	114.3	560	75.	90	113.6	290	75.

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1,2-(CH₃)₂C₆H₄ 1,2-DIMETHYLBENZENE (2-METHYLTOLUENE, o-XYLENE)

$$\lambda = A[1 + B(1 - T_r)^{1/3} + C(1 - T_r)^{2/3} + D(1 - T_r)]$$

where

λ = thermal conductivity at saturation pressure (mW/m K)

$$T_r = T/T_c, \quad T = \text{temperature (K)}$$

$$T_c = 630.33 \text{ K}$$

$$A = 54.349, \quad B = 1.8, \quad C = -4.4, \quad D = 5.4$$

T K	λ mW/m K	T K	λ mW/m K	t °C	λ mW/m K	t °C	λ mW/m K
247.95	(143.8)	410	107.2	-25.2	(143.8)	140	106.5
250	(143.3)	420	105.1	-20	142.6	150	104.4
260	141.0	430	103.0	-10	140.2	160	102.4
270	138.6	440	101.0	0	137.9	170	100.3
280	136.2	450	98.9	10	135.5	180	98.3
290	133.9	460	96.9	20	133.2	190	96.3
300	131.6	470	95.0	30	130.9	200	94.4
310	129.3	480	93.0	40	128.6	210	92.4
320	127.0	490	91.1	50	126.3	220	90.5
330	124.7	500	89.3	60	124.0	230	88.7
340	122.5	510	87.4	70	121.7	240	86.8
350	120.2	520	85.6	80	119.5	250	85.1
360	118.0	530	84.	90	117.3	260	83.
370	115.8	540	82.	100	115.1	270	82.
380	113.6	550	80.	110	112.9	280	80.
390	111.4	560	79.	120	110.8	290	78.
400	109.3	570	77.	130	108.6	300	77.

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