Appendix II

ORGANIC COOLANT DATABOOK

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TOWOLDMON0022727

GENERAL PROPERTIES
(CHAIN-TYPE POLYPHENYLS)

COMPOUND	Formula	Molecular Weight	Melting Point °C.	Boiling Point °C.	Melting Point °F.	Boiling Point °F.
Biphenyl	$C_{12}H_{10}$	154.2	69.050 [2]	254.9 [30]	156 [3]	491 [3]
Terphenyl, o-	$C_{18}H_{14}$	230.3	56.25 [10]	332	133	630 [3]
Terphenyl, m-			87.45 [10]	364	189	687 [3]
Terphenyl, p-			212.7 [10]	385	415	725 [3]
Quaterphenyl, o,o-	$C_{24}H_{18}$	306.4	118	420 [3]	245 [3]	788
Quaterphenyl, m,m-			86	471	187 [3]	880 [2
Quaterphenyl, o,m-			90		195 [3]	
Quaterphenyl, p,p-			318	520 [3]	604 [3]	968
Quaterphenyl, m,p-			166		331 [3]	
5'-phenyl-*m*-terphenyl			173.7 [3]	459[2.17 mm] [3]	345	1059
2'-phenyl-*m*-terphenyl						
Quinquephenyl, m,m,m-	$C_{30}H_{22}$	382.5	98		208 [3]	
Quinquephenyl, p,p,p-			392	653	737 [3]	1209 [
Quinquephenyl, p,m,o-			144.5-145.5 [3]		292-294	
Quinquephenyl, p,m,p-			264-66 [194]		507-11	
Quinquephenyl, p,m,m-			155 [198]		311	
Quinquephenyl, o,m,o-			155.5-156.5		312-14 [14]	
Quinquephenyl, m,m,o-			113-114 [14]		235-37	
Quinquephenyl, p,p,m-						
2,5'-diphenyl-*p*-terphenyl			269-70 [9]		516-18	
2',6'-diphenyl-*p*-terphenyl			277-78 [9]		530-32	
2,3'-diphenyl-*p*-terphenyl			190-4 [9]		374-81	
Hexaphenyl, o,o,o,o-	$C_{36}H_{26}$	458.6	185		365 [3]	
Hexaphenyl, p,p,p,p-			470		877 [3]	
Hexaphenyl, p,o,o,p-			185 [9]		365	
Hexaphenyl, m,m,m,m-						
Hexaphenyl, p,p,m,p-						
2',3',5' triphenyl-*p*-terphenyl			251-53 [9]		484-88	
Heptaphenyl, p-	$C_{42}H_{30}$	534.7	545		1013 [3]	
Hexaphenyl benzene			449.5 [9]		840-42	
5'''-biphenyl[p]-p-m-p-quinphenyl			230-32 [9]	400[12mm] [9]	446-50	745
Octaphenyl, m-	$C_{48}H_{34}$	610.75				
2,2',4,4',6,6'-hexaphenylbiphenyl			348 [9]		658	
Nonaphenyl, m-	$C_{54}H_{38}$	686	166 [3]		331	
2',3',3'',6',6''-*hexaphenyl-p-quaterphenyl*			318-19 [9]		604-6	
Diciphenyl, m-	$C_{60}H_{42}$	762	184 [3]		363	
Undeciphenyl, m-	$C_{66}H_{46}$	838	202 [3]		396	
Duodeciphenyl, m-	$C_{72}H_{50}$	914	223 [3]		433	
Tredeciphenyl, m-	$C_{78}H_{54}$	990	245 [3]		473	
Quattuordeciphenyl, m-	$C_{84}H_{58}$	1066	270 [3]		518	
Quindeciphenyl, m-	$C_{90}H_{62}$	1142	292 [3]		558	
Sedeciphenyl, m-	$C_{96}H_{66}$	1218	321 [3]		610	

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GENERAL PROPERTIES
(ALKYL POLYPHENYLS)

COMPOUND	Formula	Molecular Weight	Melting Point °C.	Boiling Point °C.	Melting Point °F.	Boiling Point °F.
Methylbiphenyl, 2-	$C_{13}H_{12}$	168.2	0 (3)	255 (3)	32	491
Methylbiphenyl, 3-			4 (3)	272 (3)	40	522
Methylbiphenyl, 4-			47 (3)	267 (3)	117	513
Ethylbiphenyl, 2-	$C_{14}H_{14}$	182.3	—6 (3)	266 (3)	21	511
Ethylbiphenyl, 3-			—27 (3)	284 (3)	—17	543
Ethylbiphenyl, 4-			34 (3)	283 (3)	94	541
Dimethylbiphenyl, 2,2-	$C_{14}H_{14}$	182.3	18 (3)	264 (3)	64	507
Dimethylbiphenyl, 2,3'-			Liq. (3)	270 (3)	Liq.	518
Dimethylbiphenyl, 2,4'-			Liq. (3)	274 (3)	Liq.	525
Dimethylbiphenyl, 3,2'-					81	178
Dimethylbiphenyl, 3,3'-			7 (3)	285 (3)	45	545
Dimethylbiphenyl, 3,4'-			16 (3)	288 (3)	60	550
Dimethylbiphenyl, 4,4'-	$C_{14}H_{14}$	182.3	121 (3)	292 (3)	250	557
Dimethylbiphenyl, 2,4-			Liq. (3)	264 (3)	Liq.	507
Dimethylbiphenyl, 2,6-			Liq. (3)	263 (3)	Liq.	505
Dimethylbiphenyl, 3,4-			33 (3)	282 (3)	91	540
Dimethylbiphenyl, 3,5-			12 (3)	274 (3)	11	526
Propenylbiphenyl, 2-	$C_{15}H_{14}$	194.3				
Trimethylbiphenyl, 2,4,6-		196.3		221 (3)		430
Propylbiphenyl, 2-	$C_{15}H_{16}$	196.3	—12 (3)	277 (3)	11	531
Propylbiphenyl, 3-			Liq. (3)		Liq.	
Propylbiphenyl, 4-			40 (3)		104	
Isopropylbiphenyl, 2-	$C_{15}H_{16}$	196.3	24 (3)	270 (3)	76	518
Isopropylbiphenyl, 3-				294 (3)		561
Isopropylbiphenyl, 4-				303 (3)		577
Isopropylbiphenyl, Mixture 3 & 4			—54 (18)	295 (18)	—65	563
n-Butylbiphenyl, 2-	$C_{16}H_{18}$	210.3	—13 (3)	291 (3)	8	556
Sec-Butylbiphenyl, 2-			8 (3)	282 (3)	46	540
tert-Butylbiphenyl, 2-			21 (3)	282 (3)	70	540
tert-Butylbiphenyl, 4-			53 (3)		127	
tetramethylbiphenyl, 2,2',5,5'-	$C_{16}H_{18}$	210.3		285 (3)		545
tetramethylbiphenyl, 2,2',6,6'-			67 (3)		152	
Di-ethylbiphenyl, 2,2'-				274 (3)		526
Di-ethylbiphenyl, 4,4'-			81 (3)	313 (3)	178	595
Isopropylbiphenyl, 2-methyl-5-			Liq. (3)	269 (3)	Liq.	516
Amylbiphenyl	$C_{17}H_{20}$	224.3	0	305	32 (75)	581
Hexamethylbiphenyl	$C_{18}H_{18}$	234.3	52 (3)	320 (3)	126	608

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TOWOLDMON0022729

GENERAL PROPERTIES
(ALKYL POLYPHENYLS)

COMPOUND	Formula	Molecular Weight	Melting Point °C.	Boiling Point °C.	Melting Point °F.	Boiling Point °F.
Hexylbiphenyl, 2 (?)-	$C_{18}H_{22}$	238.4	—38 (3)	318 (3)	—36	604
Hexylbiphenyl, 3 (?)-			—40 (3)	322 (3)	—40	611
Diisopropylbiphenyl (mixed isomers)			—31 (10)	330 (10)	—24	626
Di-n-Butylbiphenyl, 4,4' --	$C_{20}H_{26}$	266.4	58 (3)	384 (3)	137	723
Di-sec-Butylbiphenyl, 4,4'-			Liq. (3)	363 (3)	Liq.	685
Di-tert-Butylbiphenyl, 4,4			128 (3)	326 (3)	263	619
Di-tert-Amylbiphenyl, 4,4'-	$C_{22}H_{30}$	294.5	Liq. (3)	360 (3)	Liq.	680
Dihexylbiphenyl	$C_{24}H_{34}$	322.5	—30	375	—22 (3)	707
Trihexylbiphenyl	$C_{30}H_{48}$	406.7	—23	436	—9 (3)	816 (3)
o-Terphenyl, 6'-methyl	$C_{19}H_{16}$	244.3		150^{2mm} (3)		302^{2mm}
o-Terphenyl, 4-vinyl-	$C_{20}H_{16}$	256.3		193.5^{4mm} (3)		455.8^{4mm}
o-Terphenyl, 3',6'-dimethyl-	$C_{20}H_{18}$	258.3	109 (3)		228	
o-Terphenyl, isopropyl-	$C_{21}H_{20}$	272.4		170$^{0.13mm}$ (3)		352$^{0.13mm}$
o-Terphenyl, 4-butyl-	$C_{22}H_{22}$	286.4	46 (3)	161^{1mm} (3)	111	329^{1mm}
m-Terphenyl, 5'-methyl-	$C_{19}H_{16}$	244.3	130 (3)		266	
m-Terphenyl, 4-propyl-	$C_{21}H_{20}$	272.4	44 (3)	394 (3)	112	741
m-Terphenyl, Isopropyl-			—8	406 (3)	20 (3)	762
m-Terphenyl, 4,4",5'-trimethyl			117 (3)		243	
m-Terphenyl, 5,5',5"-trimethyl-			65 (3)		149	
m-Terphenyl, nonyl (?)	$C_{27}H_{32}$	300.4	100	415	212 (25)	779 (25)
m-Terphenyl, 4-n-octyl-	$C_{26}H_{30}$	342.5		280^{20mm} (193)		536^{20mm}
m-Terphenyl, 4,4"-dimethyl-5'-tolyl	$C_{28}H_{26}$	348.5	170-1 (9)		338-40	
p-Terphenyl, 2-methyl-	$C_{19}H_{16}$	244.3	92 (3)		197	
p-Terphenyl, 3-methyl-			169 (3)		337	
p-Terphenyl, 4-methyl-			207 (3)		405	
p-Terphenyl, 2,5-dimethyl-	$C_{20}H_{18}$	258.3	159 (3)		319	
p-Terphenyl, 2',5'-dimethyl-			183 (3)		361	
p-Terphenyl, 4',4"-dimethyl-			249 (3)		481	
p-Terphenyl, 2,2",5,5"-tetramethyl-	$C_{22}H_{22}$	286.4	112 (3)		233	
p-Terphenyl, diethyl-			280 (9)		536	
p-Terphenyl, 4,4'-dicyclohexyl-	$C_{30}H_{34}$	394.6		270$^{2.6mm}$ (9)		889 (9)
o,o-quaterphenyl, 2,2'"-dimethyl	$C_{28}H_{26}$	334.4	113 (3)		236	
o,o-quaterphenyl, 4,4'"-dimethyl			113 (9)		236	
p,p-quaterphenyl, 4,4'"-dimethyl			334 (3)		633	
3'-phenyl-p-terphenyl, 2-methyl	$C_{25}H_{20}$	320.4	130 (197)		265	
2-phenyl-p-terphenyl, 3',6'-dimethyl	$C_{26}H_{22}$	334.4	157 (193)		315	
p-hexaphenyl, 4,4'"-dimethyl	$C_{32}H_{26}$	410.4	162-63 (9)		324.25	

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MIXTURE COMPOSITION	Liquid Composition (mol%)			Vapor Composition (mol%)			M.P.	B.P.	M.P.	B.P.	Reference
	1st	2nd	3rd	1st	2nd	3rd	°C.	°C.	°F.	°F.	
Biphenyl/naphthalene	57	43		36.6	63.4		39.5	234.5	103	454	(17)
Biphenyl/*o*-terphenyl	40.5	59.5		79.1	20.9		23	286.5	73.4	547	(17)
Biphenyl/*m*-terphenyl	45	55					42		108		(1)
Biphenyl/*p*-terphenyl	97.1	2.9					67.8		154		(10)
m-terphenyl/*o*-terphenyl	33.7	66.3		20.9	79.1		29.3	345.5	85	654	(17)
m-terphenyl/*p*-terphenyl	95.65	4.35					85.5		185.9		(10)
o-terphenyl/*p*-terphenyl	98.45	1.55					55.75		132.2		(10)
Biphenyl/Santowax R	91.7	8.3					69		157		(20)
naphthalene/*o*-terphenyl	33.7	66.3		87.3	12.7		29.2	263	85	505	(17)
Biphenyl/*m*-terphenyl/naphthalene	41.0	29.0	30.0	38.2	1.8	60.0	23.6	250	75	482	(17)
Biphenyl/*m*-terphenyl/phenanthrene	42.5	30.9	26.6	85.4	5.3	9.3	25.3	288	78	550	(17)
Biphenyl/naphthalene/phenanthrene	42.6	37.0	20.4	33.2	64.4	2.4	25.4	242.5	78	468	(17)
Biphenyl/*o*-terphenyl/naphthalene	31.2	47.8	21.0	37.3	9.3	53.4	10.9	262	51	504	(17)
Biphenyl/*o*-terphenyl/phenanthrene	31.9	48.7	19.4	71.8	20.3	7.9	11.9	294	53	561	(17)
Biphenyl/*o*-terphenyl/*m*-terphenyl	30.9	47.5	21.6	74.1	21.3	4.6	10.5	297.5	51	568	(17)
Biphenyl/*o*-terphenyl/*p*-terphenyl	40.2	59.2	0.6	79.3	21.0	0.08	22.7	287	73	549	(17)
o-terphenyl/*m*-terphenyl/naphthalene	51.9	24.5	23.6	15.2	3.3	81.5	15.3	279	59	534	(17)
o-terphenyl/*m*-terphenyl/phenanthrene	53.2	25.2	21.6	61.7	14.9	23.4	16.6	344	62	651	(17)
o-terphenyl/*m*-terphenyl/*p*-terphenyl	65.8	33.5	0.7	79.1	20.6	0.3	28.9	346	84	655	(17)
o-terphenyl/naphthalene/phenanthrene	53.4	24.6	22.0	14.3	79.9	5.8	16.9	275.5	62	528	(17)
o-terphenyl/naphthalene/*p*-terphenyl	65.8	33.5	0.7	13.0	86.8	0.04	28.9	263	84	505	(17)

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