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MONSANTO TERPHENYLS

TECHNICAL BULLETIN No. PL-310

JANUARY, 1958

Monsanto

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ST. LOUIS 3, MISSOURI

0615148

TOWOLDMON0039220

MONSANTO *terphenyls*

INTRODUCTION

The Monsanto terphenyls are a series of hydrocarbon solids ranging in melting point from a little above room temperature to as high as 210° C. (410°F.).

Monsanto terphenyls are used as plasticizers, softening agents, wax additives and extenders, and in paper coatings. This bulletin presents various properties of the terphenyls so that the proper one may be selected for specific applications.

The information contained in this bulletin is, to our best knowledge, true and accurate, but all recommendations or suggestions are made without guarantee, since the conditions of use are beyond our control. The Monsanto Chemical Company disclaims any liability incurred in connection with the use of these data or suggestions.

Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing patents covering any material or its use.

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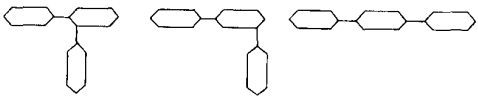
PHYSICAL PROPERTIES

	Ortho	*Meta*	*Para*
Formula			
Color, (Gardner 1953)	5.0 max.	6.0 max.	6.0 max.
Density, 212° F. g./cc.	1.022	1.040	0.960 (412° F.)
Melting point			
Completely liquid	56.3° C.	87.5° C.	212° C.
Solidification temperature			
First crystals	—	93° C. max.	207-213° C.
Hold point	49.0-54.5° C.	82° C. min.	—
Distillation range	333-350° C.	368-378° C.	381-388° C.
D-20 corrected	(626-662° F.)	(694-712° F.)	(718-730° F.)
1st drop - 96%			
Flash point	171° C. (340° F.)	207° C. (405° F.)	207° C. (405° F.)
Flame point	193° C. (390° F.)	229° C. (445° F.)	238° C. (460° F.)
Viscosity, at 210° F., S.U.S.	40.6 (See Graph No. 1)	39.3	28.8 (at 225° C.)
Solubility	See Graphs Nos. II, III and IV		

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Vapor Pressure, mm. Hg

Temperature, ° C.	*Ortho*-terphenyl	*Meta*-terphenyl	*Para*-terphenyl	
90	0.17	—	—	
100	0.3	—	—	
110	0.5	0.15	—	
120	0.9	0.3	—	
130	1.5	0.5	—	
140	2.4	0.8	0.15	
150	3.7	1.3	0.3	
160	5.7	2.0	0.6	
170	8.2	3.0	1.0	
180	12.0	4.6	1.9	Solid
190	18.0	6.8	3.2	
200	25.0	9.8	5.5	
210	35.0	14.0	9.1	
220	46.0	19.0	14.0	
230	62.0	26.0	19.0	
240	82.0	36.0	26.0	
250	110.0	48.0	35.0	
260	140.0	63.0	46.0	
270	180.0	83.0	61.0	
280	230.0	110.0	80.0	
290	290.0	140.0	101.0	
300	360.0	180.0	130.0	
310	450.0	220.0	165.0	
320	550.0	270.0	210.0	
330	670.0	340.0	260.0	
340	810.0	410.0	320.0	
350	990.0	500.0	390.0	
360	1160.0	610.0	470.0	
370	1390.0	730.0	570.0	
380	1600.0	870.0	680.0	

ELECTRICAL PROPERTIES

Form	Dielectric Constant	Resistivity (ohm/cm.) 100°C.	250°C.
Ortho-	2.54	8200×10^{9}	—
Meta-	2.62	2600×10^{9}	—
Para-	—	—	30×10^{9}

STABILITY

Boiling in 10% sulfuric acid or caustic soda has no detectable effect on the terphenyls.

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COMPATIBILITY, *Ortho*-terphenyl

Component	Per Cent Ortho-terphenyl in Mixture				
	10	25	50	75	90
Paraffin (120°/125°F.)	C	—	C	—	C
Barnsdall (160°/165°F.)	C	—	C	—	C
Beeswax	C	C	C	—	I
Opal Wax	C	—	I	—	I
Stearic Acid	I	I	I	—	I
"N" Wood Rosin	C	C	I	I	—

COMPATIBILITY, *Meta*-terphenyl

Component	Per Cent Meta-terphenyl in Mixture				
	10	25	50	75	90
Paraffin (120°/125°F.)	Incompatible with 2% or more *meta*-terphenyl				
Barnsdall Wax (160°/165°F.)	—	C	B	I	I
Ceresin	I	—	I	—	I
Carnauba Wax	C	—	C	C	I
Candelilla Wax	C	C	I	—	I
Montan Wax	I	—	I	—	I
Beeswax	I	—	I	—	I
Japan Wax	C	I	I	—	—
Opal Wax	C	C	I	—	I
I. G. Wax O	I	—	I	—	I
Stroba Wax	I	—	I	—	I
Acra Wax	C	—	C	—	B
Stearic Acid	I	—	I	—	I
Shellac	C	—	I	—	I
Manila Resin (Loba B)	C	—	I	—	I
Ester Gum	C	—	I	—	I
"N" Wood Rosin (Hercules)	C	C	I	—	I
Piccolite Resin (85°)	C	—	I	—	I
Staybellite Resin	B	—	I	—	I

COMPATIBILITY, *Para*-terphenyl

Component	Per Cent Para-terphenyl in Mixture				
	0.5	1-2	3	5	10-75
Paraffin (120°-125° F.)	I	—	—	—	—
Paradene No. 1	—	—	—	C	I
Paradene No. 2	—	C	I	—	—
"N" Wood Rosin	—	—	—	—	I

CODE: C = Compatible
I = Incompatible
B = Almost Compatible

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COMPARATIVE HARDNESS

Material	Hardness* 50 Grams	150 Grams	250 Grams
Meta-terphenyl	0	0	2.3
Para-terphenyl	0	0	3.3
Carnauba wax	0	2.3	4.7
Candelilla wax	0	3.3	4.7
Ortho-terphenyl	1.3	4.0	10.7
50% Paraffin, 50% *meta*-terphenyl	3.7	12.3	18.0
75% Paraffin, 25% *meta*-terphenyl	7.3	18.0	25.3
Ceresin wax	9.3	15.7	26.0
95% Paraffin, 5% *meta*-terphenyl	10.7	21.0	29.7
98% Paraffin, 2% *meta*-terphenyl	11.7	26.0	32.7
Paraffin wax	14.3	23.3	31.3
Montan wax	15.0	28.7	37.3
Mixed isomeric terphenyl			
No aging	60.0	—	—
Aged 24 hours	28.7	—	—

*Average Penetration in cm. x 10^{-2} in 60 seconds at 25°C. under load indicated. ASTM D-5-25. Smaller values denote greater hardness.

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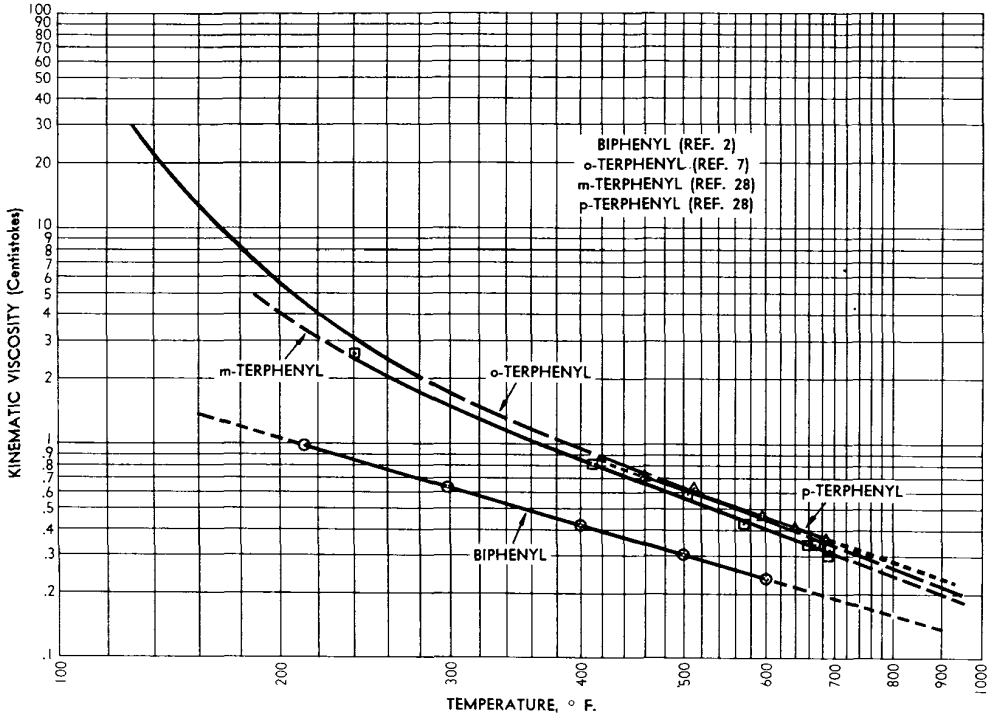

VISCOSITY OF POLYPHENYLS

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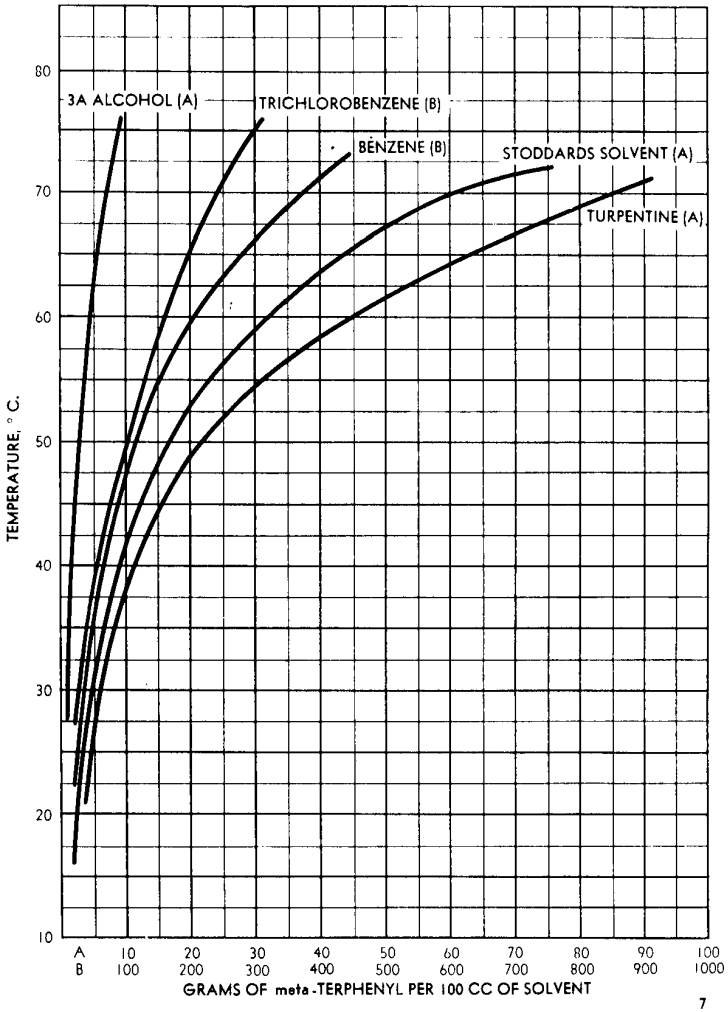
SOLUBILITY OF meta-TERPHENYL



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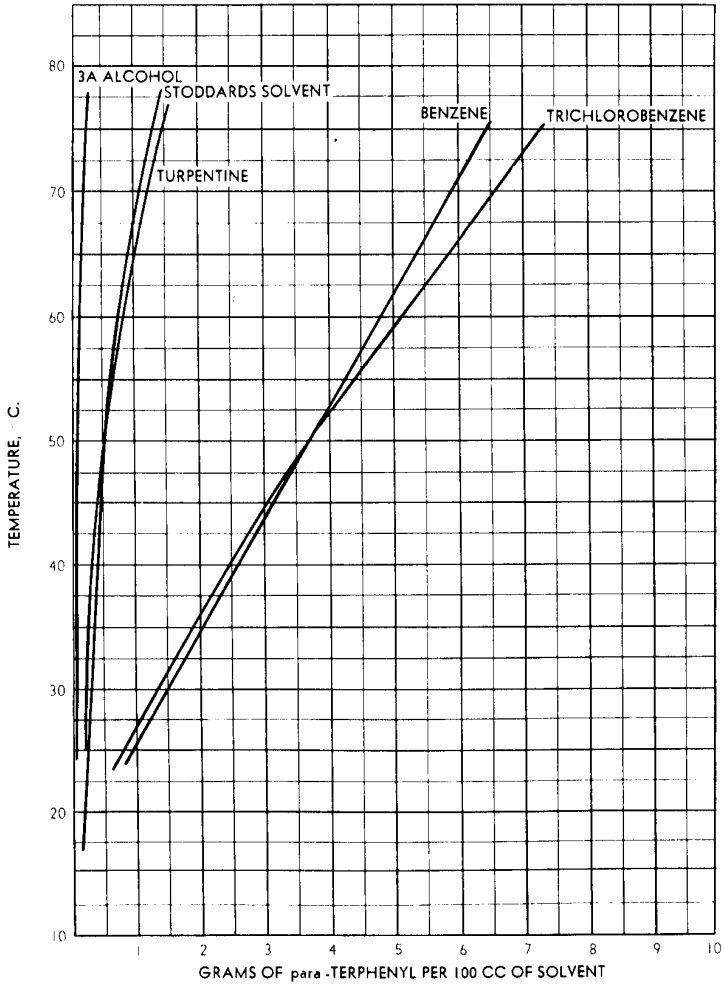
SOLUBILITY OF para-TERPHENYL



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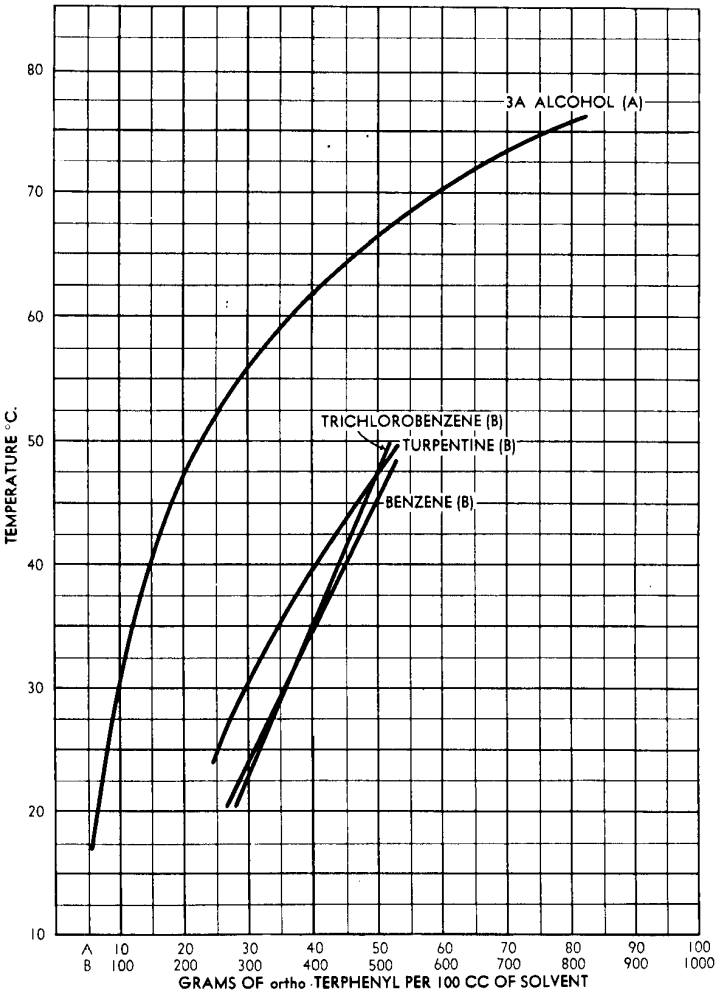
SOLUBILITY OF ortho-TERPHENYL



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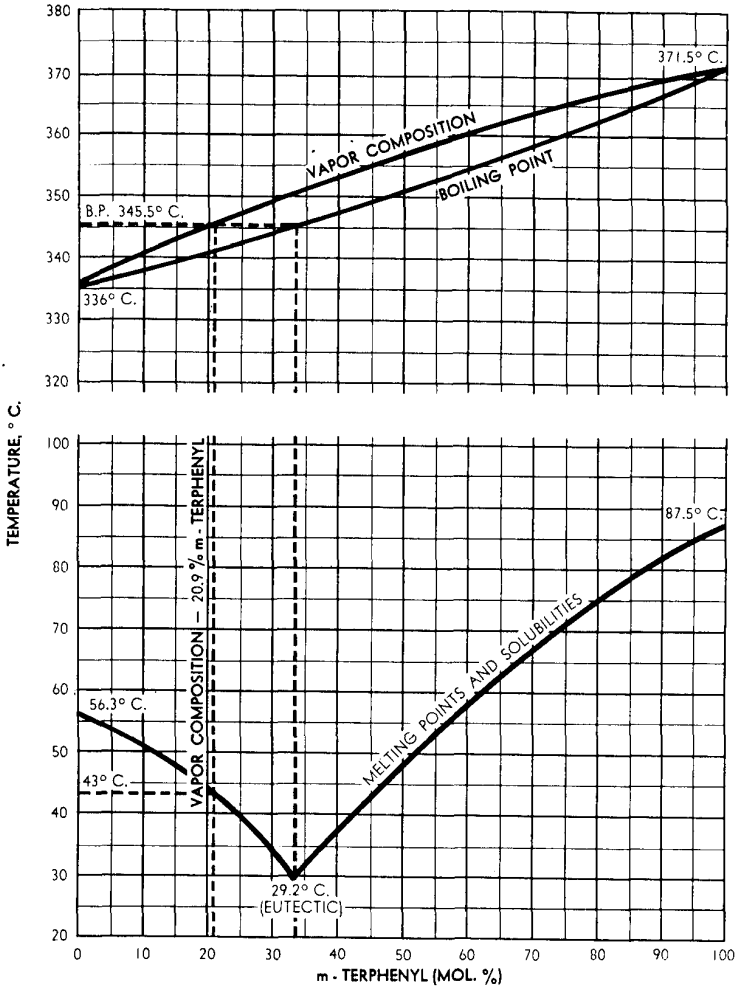
m-TERPHENYL / o-TERPHENYL
MIXTURES
(MELTING POINTS)
(BOILING POINTS)
(VAPOR COMPOSITIONS)
(SOLUBILITIES)



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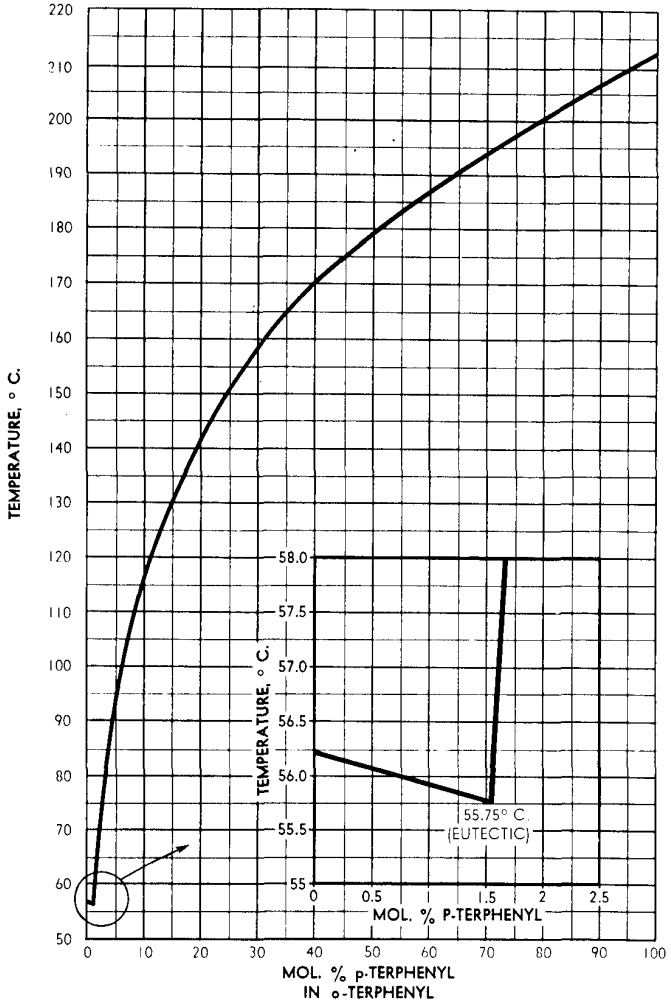
o-TERPHENYL/p-TERPHENYL
MIXTURES
MELTING POINTS AND SOLUBILITIES



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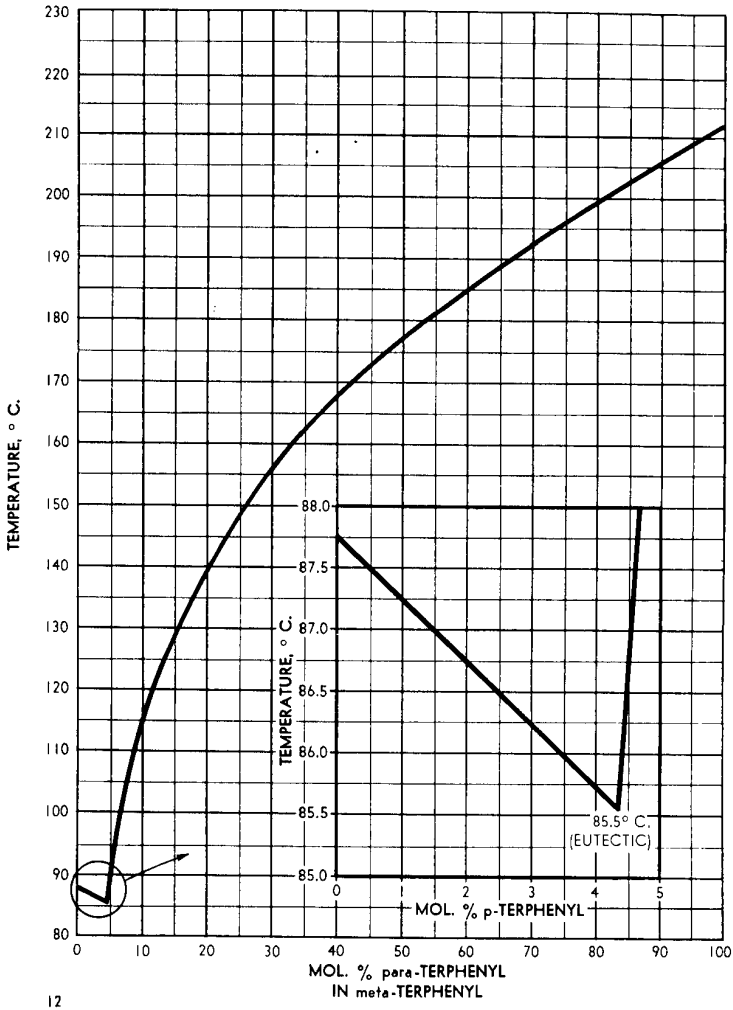
m-TERPHENYL/p-TERPHENYL
MIXTURES
MELTING POINTS AND SOLUBILITIES



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