MONSANTO TRADE LITERATURE
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# 56

# MONSANTO TERPHENYLS

TECHNICAL BULLETIN No. PL-310

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TOWOLDMON0039844
WATER_PCB-00024313

# 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.

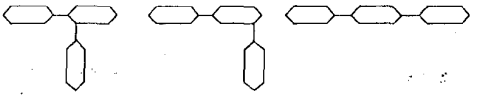
Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing patents covering any material or its use.



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TOWOLDMON0039845
WATER_PCB-00024314

## 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 | $8200 \times 10^9$ | — |
| *Meta*- | 2.62 | $2600 \times 10^9$ | — |
| *Para*- | — | — | $30 \times 10^9$ |

## 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

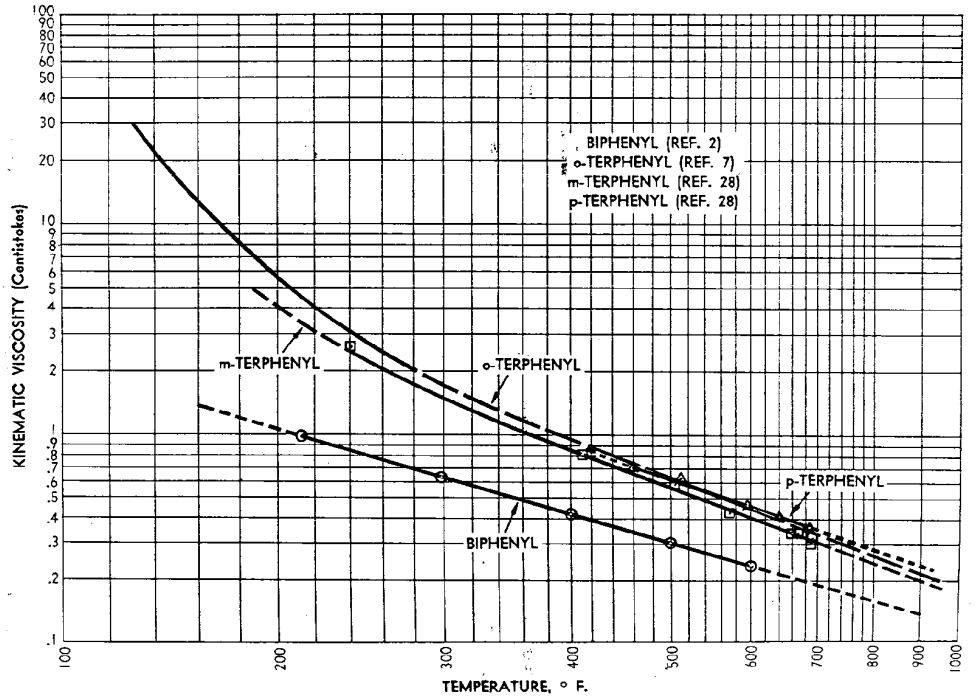
| Material | Hardness* 50 Grams | 150 Grams | 250 Grams |
|---|---|---|---|
| *Meta*-terphenyl | 0 | 0 | 2.3 |
| *Para*-terphenyl | 0 | 0 | 3.3 |
| Carnauba wax | 0 | 2.3 | 4.7 |
| Candelilla wax | 0 | 3.3 | 4.7 |
| *Ortho*-terphenyl | 1.3 | 4.0 | 10.7 |
| 50% Paraffin, 50% *meta*-terphenyl | 3.7 | 12.3 | 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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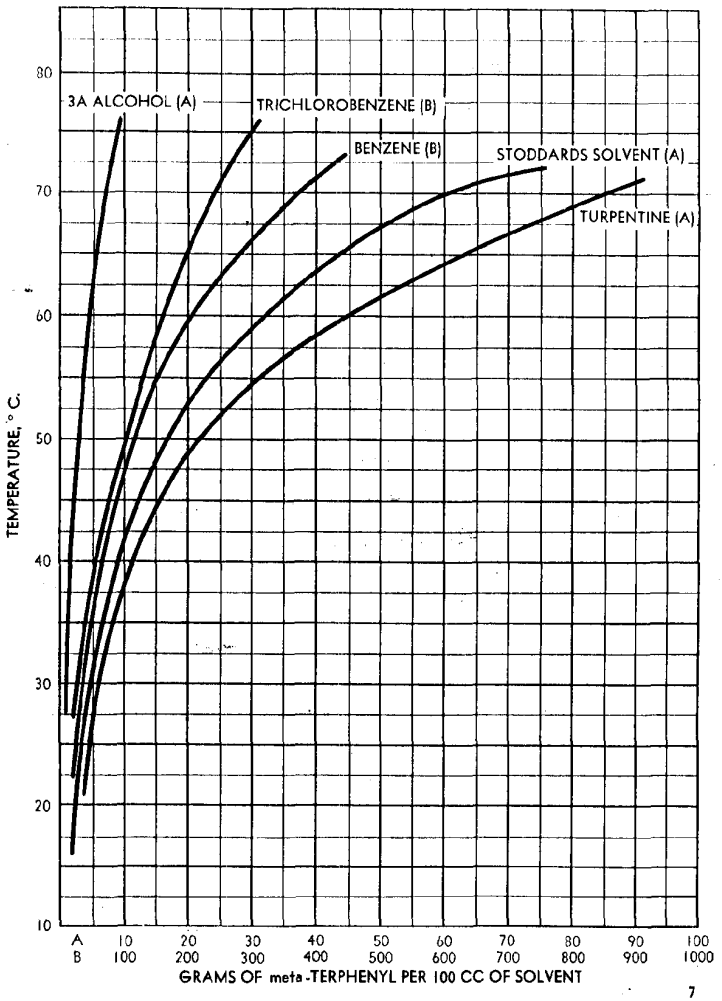



VISCOSITY OF POLYPHENYLS

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## SOLUBILITY OF meta-TERPHENYL

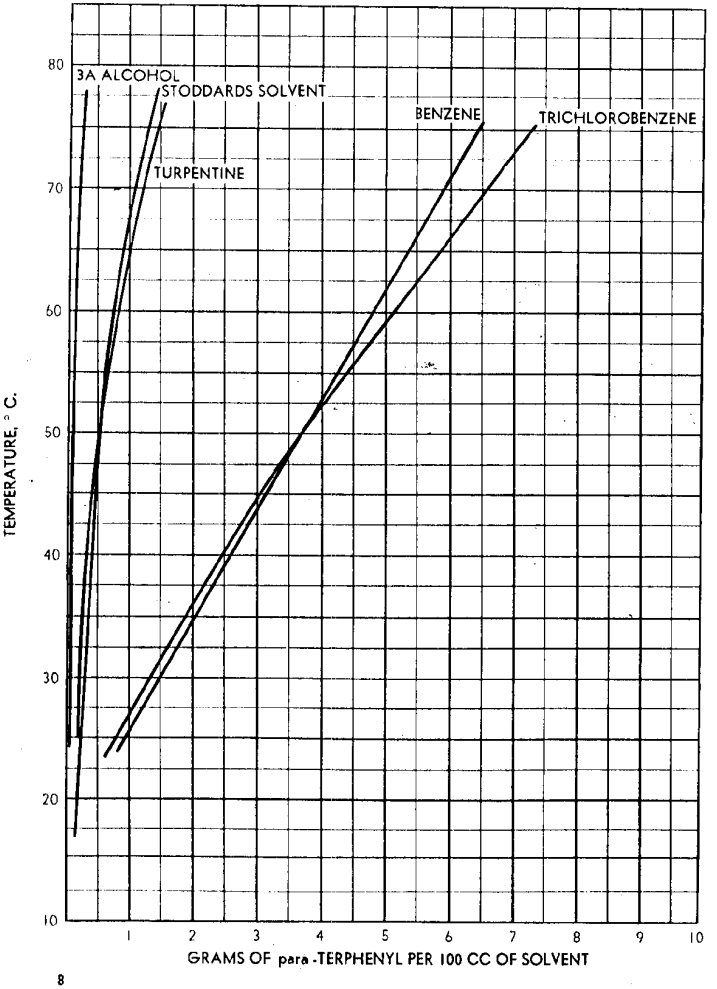





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## SOLUBILITY OF para-TERPHENYL

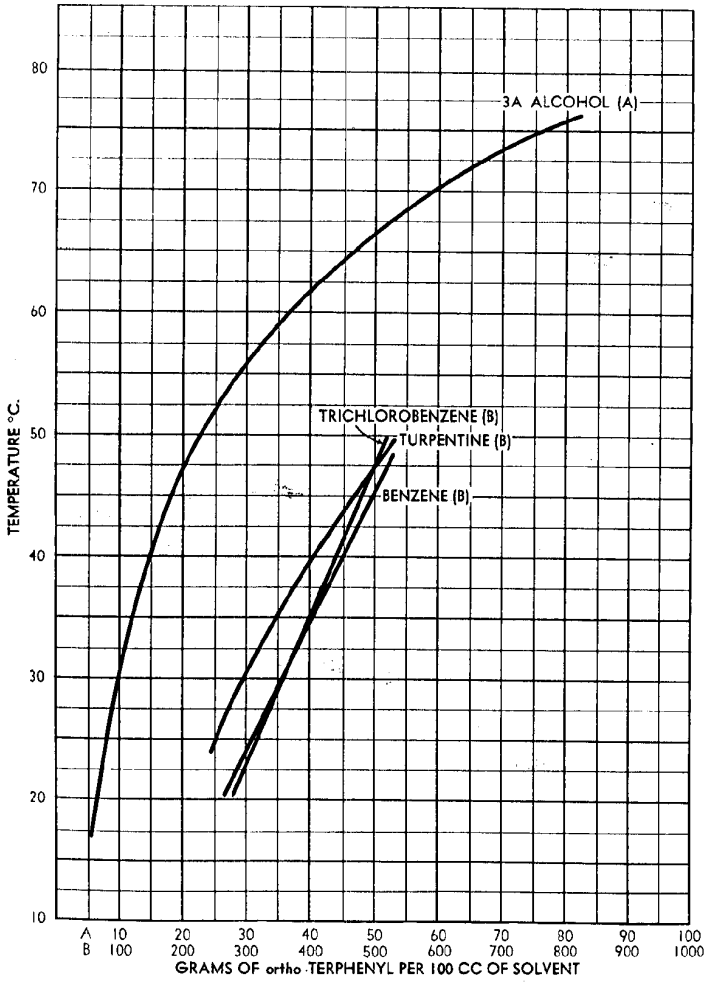





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## SOLUBILITY OF ortho-TERPHENYL

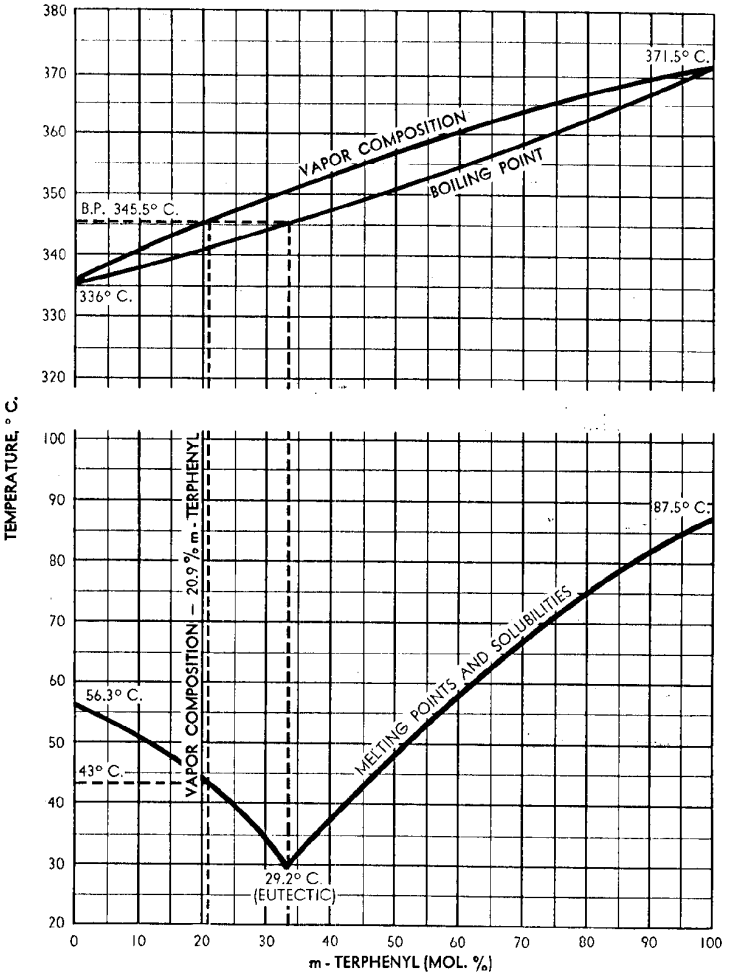





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TOWOLDMON0039853
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**m-TERPHENYL / o-TERPHENYL**
**MIXTURES**
(MELTING POINTS)
(BOILING POINTS)
(VAPOR COMPOSITIONS)
(SOLUBILITIES)

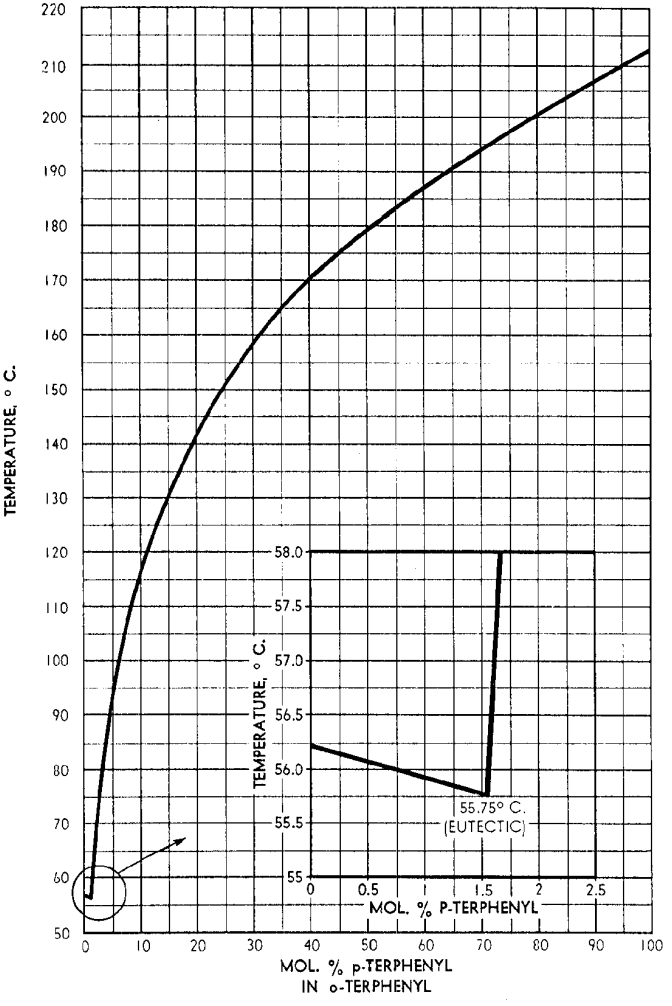



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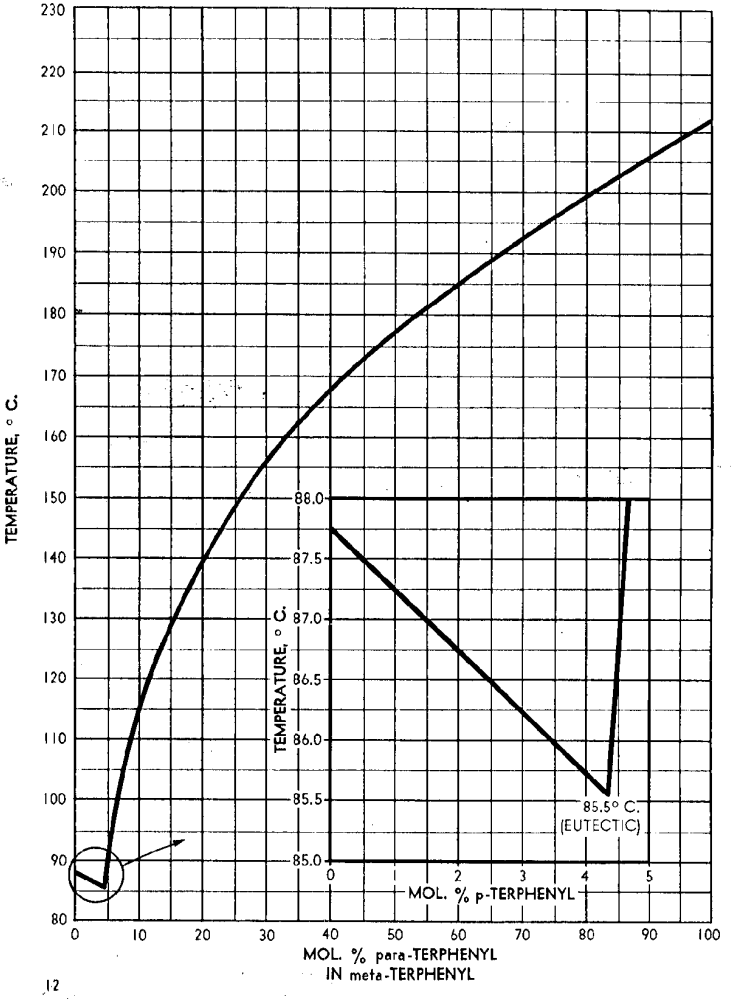
## o-TERPHENYL/p-TERPHENYL
## MIXTURES
## MELTING POINTS AND SOLUBILITIES






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TOWOLDMON0039855
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## m-TERPHENYL/p-TERPHENYL MIXTURES MELTING POINTS AND SOLUBILITIES

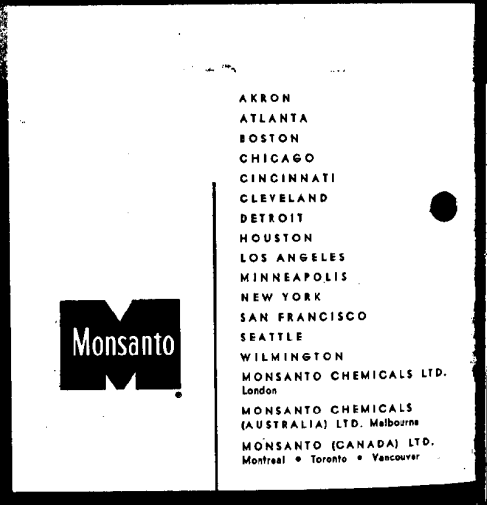





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