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ORTHO-NITROBIPHENYL
(Ortho-Nitrodiphenyl)

AS A

PLASTICIZER

DEVELOPMENT DEPARTMENT
ORGANIC CHEMICALS DIVISION
MONSANTO CHEMICAL COMPANY
ST. LOUIS, MISSOURI

0614270

TOWOLDMON0038442

ORTHO-NITROBIPHENYL

INTRODUCTION

Ortho-Nitrobiphenyl, formerly sold as Ortho-Nitrodiphenyl, is a good general purpose plasticizer. Its low cost makes it worthy of consideration for use in most types of lacquer and plastic compositions.

Ortho-Nitrobiphenyl (ONB) is compatible with the cellulose esters and ethers, Polyvinyl Chloride, Polyvinyl Chloride copolymers, Polyvinyl Formal, Polyvinyl Butyral, Polyvinyl Acetate, Polystyrene, rosin, rosin esters, modified rosin esters, modified phenolic resins, oil soluble phenolic resins, alkyd resins and vegetable oils. Due to its wide range of compatibility it is finding use in many different types of industry.

ONB is solving several problems where it is necessary to have an extremely low rate of hydrolysis, resistance to acid and alkali with low susceptibility to attack by mineral oil.

ORTHO-NITROBIPHENYL

AS A PLASTICIZER

DESCRIPTION:

Ortho-Nitrobiphenyl is a low-priced, all round plasticizer useful with practically every type of synthetic resin. It is a light yellow to reddish colored liquid or solid of characteristic odor.

PHYSICAL AND CHEMICAL PROPERTIES: (From Typical Analyses)

Formula

NO₂



Molecular Weight	199.20
Melting Point	Approx. 35° C. (Supercools readily)
Boiling Point at 10 mm.	Approx. 172° C.
Boiling Point at 760 mm.	Approx. 330° C.
Refractive Index at 25° C.*	Approx. 1.613
Specific Gravity at 40°/15.5° C.	Approx. 1.189
Viscosity at 25° C.*	38 Centipoises
Viscosity at 45° C.	12 Centipoises
Weight/gallon	Approx. 9.9 lbs.
Flash Point	143° C. (289.5° F.)
Fire Point	179° C. (354.5° F.)

* Obtained on supercooled material.

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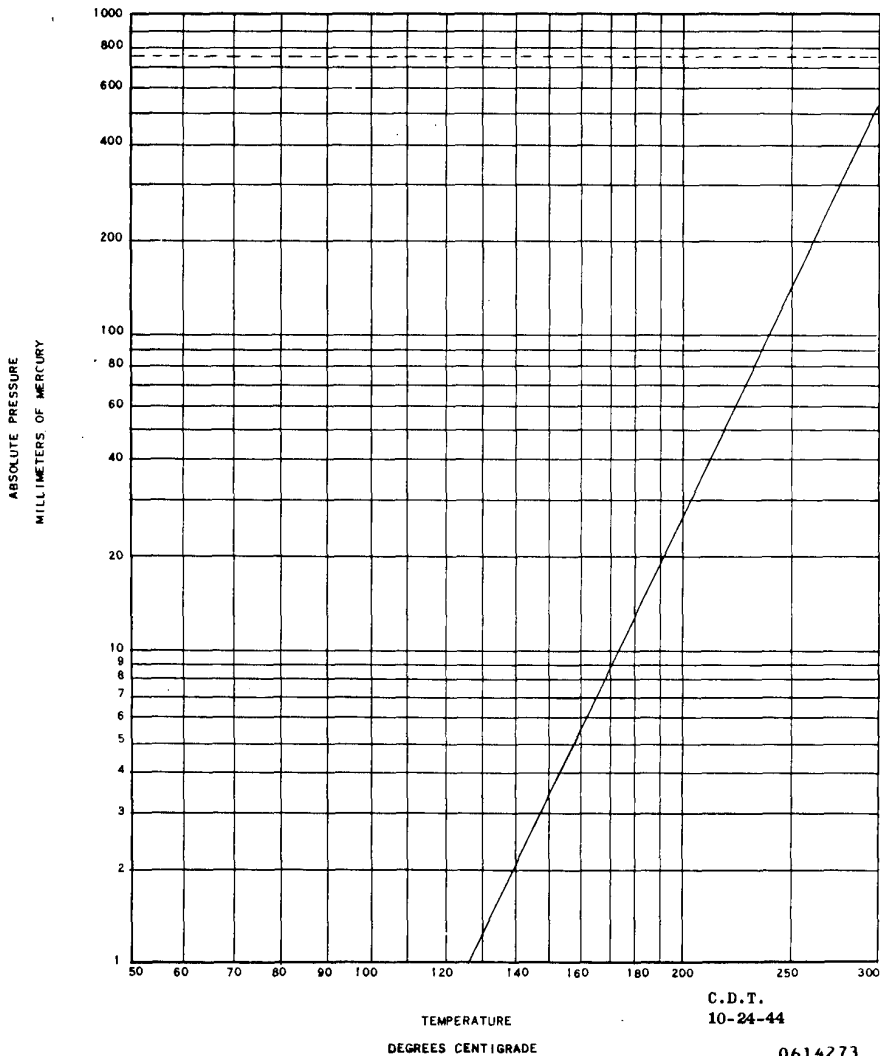
St. Louis, U.S.A.

VAPOR PRESSURES

(Approximate)

ORTHO NITROBIPHENYL

(Ortho-Nitrodiphenyl)



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PHYSICAL AND CHEMICAL PROPERTIES (Cont'd)

Solubility:

Practically insoluble in water (either hot or cold). Readily soluble in --

Benzene	Carbon Tetrachloride
Ethyl Alcohol	Perchlorethylene
Methyl Alcohol	Glacial Acetic Acid
Ether	Mineral Spirits
Acetone	Pine Oil
Methyl Ethyl Ketone	Turpentine
Ethyl Acetate	Linseed Oil
Amyl Acetate	Soya Bean Oil
Ortho-Dichlorobenzene	Corn Oil

PLASTICIZING PROPERTIES:

ONB is a plasticizer for most resins, both synthetic and natural. The amounts required vary with the resin and the properties needed for any particular application. ONB may be used as the sole plasticizer or in conjunction with one or more other plasticizers. The general effect of ONB in several plastics follows:

Cellulose Nitrate (Plastics Grade)

In molded Cellulose Nitrate, the plasticizing action of ONB is similar to that of camphor. In some compositions, ONB seems better than camphor. The two plasticizers work well together or camphor oil may be substituted for part or all of the camphor in the formula. The range of practical use would probably be up to forty parts by weight of ONB for each one hundred parts of Cellulose Nitrate, although higher proportions can be used if desired.

Cellulose Nitrate (Lacquer Grade)

In lacquers, ONB produces hard, tough, resistant compositions. ONB aids solvent release.

PLASTICIZING PROPERTIES (Cont'd)

Cellulose Acetate

ONB is highly compatible. 50 parts of ONB per 100 parts Cellulose Acetate give clear, transparent compositions of good molding properties and medium flexibility.

Cellulose Acetobutyrate

ONB is compatible and produces hard, tough compositions suitable for molding. In Cellulose Acetobutyrate lacquers, ONB forms tough durable films.

Cellulose Acetopropionate

ONB plasticizers this in about the same manner as it does Cellulose Acetate.

Polyvinyl Acetate (Gelva)

ONB is highly compatible. 50 parts per 100 parts of Polyvinyl Acetate give very flexible compositions which are quite tacky. Its usefulness in adhesives and cements is indicated.

Polyvinyl Formal (Formvar)

ONB used in equivalent amounts produces greater flexibility here than in Cellulose Acetate. Temperatures of 150° - 160° C. are required for good flow in molding. Coatings containing 50 parts per 100 parts of Polyvinyl Formal have good weather resistance.

Polyvinyl Butyral (Butvar)

50 parts ONB produce very flexible, slightly tacky, compositions, but this is about the upper limit of compatibility. At 40 parts very flexible compositions result. Temperatures of 120°-130°C. are sufficient for good flow. 50 parts produce Butvar coatings with good weather resistance.

PLASTICIZING PROPERTIES (Cont'd)

Polyvinyl Chloride (Geon 101)

Requires a relatively high working temperature (Above 150°C.) and the use of some stabilizer (such as lead carbonate). ONB is quite satisfactory as a plasticizer. 40 parts produce hard, tough, flexible, transparent compositions. At 50 parts there is some crystallization on long standing. The compatibility limit is somewhere between 40 and 50 parts.

Vinylite VYHH

30 parts ONB produce hard, rather brittle compositions, but 40 parts ONB give very flexible ones. 50 parts are just about the compatibility limit. Flows at 110° - 120°C.

Vinylite VYNW

ONB produces about the same flexibility with this resin as for VYHH but the compatibility limit is somewhat lower. It requires temperatures over 150°C. for good flow.

Polystyrene

ONB is highly compatible and imparts flexibility without causing the undue softening and tackiness resulting from the use of the usual types of plasticizers.

Ethyl Cellulose

ONB is compatible to the extent of 45% in 48% ethoxy, 100 cps. ethyl cellulose and produces compositions of good weather resistance.

Varnishes

ONB may be used to good advantage in both alkyd resins and oleo-resinous varnishes. Amounts up to 10% appear to have no effect upon drying time, and retard skinning to a slight degree.

ONB has a tendency to yellow when exposed to heat and light in some formulations.

FUNGICIDAL PROPERTIES:

Coated textiles, where ONB was the plasticizer and the base plastic of the coating was Polyvinyl Acetate, Polyvinyl Formal, Polyvinyl Butyral, Cellulose Acetate, Vinylite VIHH, or Polystyrene, did not support growth of *Aspergillus niger*, *Penicillium*, *Chaetomium globosum* or *Metarrhizium*, even after the coated textiles have been leached in running water for 48 hours.

Heating the coated textiles for 5 days at 105°C., resulted in some loss in fungus resistance.

TOXICITY AND SAFE HANDLING:

Toxicological tests upon rats and rabbits indicate a toxicity of the same order as Tricresyl Phosphate and Triphenyl Phosphate. The precautions necessary in the use of the Phosphates are therefore applicable to ONB. It should be noted however that the type of damage caused by the phosphates and by ONB is entirely different in character, the former acting chiefly upon the central nervous system whereas the latter appears to affect primarily the blood and thereby causing respiratory and muscular failure.

Patch tests indicate that ONB is neither a primary irritant nor a sensitizing agent.

The breathing of concentrated vapors of ONB appears to be the most harmful method of contact. Ventilation and efficient removal of vapors by some means such as hoods over the working areas should be provided.

The interpretation of toxicological data is individual in character and detailed information concerning its relationship to any specific application will be supplied upon request.

SUGGESTED USES:

1. Camphor substitute in Cellulose Nitrate compositions.
2. Plasticizer in thermoplastic molding compositions.

SUGGESTED USED (Cont'd)

3. Plasticizer in lacquer type coatings to improve water, acid and alkali resistance.
4. Stabilizer with some plasticizing action in varnishes.
5. Fungicide in paints, varnishes, lacquers, plastics, textile coatings and impregnating compositions.
6. In anti-fouling paints.

CONTAINERS:

Standard containers are 55 gallon drums containing approximately 525 lbs.

AKCDT 745 50

NOTICE

The information on Ortho-Nitrobiphenyl contained herein 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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