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TOHMIDE 394-N

TOHMIDE 394-N is a solid type fatty polyamide resin synthesized by a polycondensation of mainly the dimerized fatty acid and the alkylenepolyamines.The major applications of TOHMIDE 394-N are in the rotogravure printing inks .

1：Major Characteristics

TOHMIDE 394-N shows superior adhesion onto wide variety of surface so that it is highly useful for rotogravure ink formulation .The followings are the major characteristics of the TOHMIDE 394-N as used in a rotogravure ink formulation;

(a). Good solubility into various conventional industrial solvents.
(b). Superior adhesion onto many kind of substrates.
(c). Good wetting(=dispersion,)of the pigments and dyestuffs.
(d). Good resistance to water, oil and chemicals..
(e). Fast release of the solvent from the printed film..
(f). Smooth and hard film surface with high gloss.
(g). Smooth and hard film surface with high gloss, which is suitable for over-printings.
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2：Sales Specifications

Appearance	：Brown Yellow Pellets
Softening Point (Ball and Ring /℃)	：110 ±5
Viscosity (Gardner-Holdt / 25℃)	：*H ~ K
Color (Gardner)	：*10 Max
Sp.Gr. (25/25℃)	：0.98
Acid Value (mg-KOH / gm)	：7 Max
Amine Value (mg-KOH / gm)	：3 Max

*The solution viscosity of TOHMIDE 394-N are of 50% solution in Toluene/ Methanol (1：1)

3：Solubility Data

SOLVENT	TOHMIDE 394-N	
	Resin content (%)	Solubility
Ethylalcohol	40	In
Ethylalcohol	30	In
	20	In
Isopropanol (I P A)	40	Gel
	30	Gel
	20	< A

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n-Propanol	40	J
	30	C
	20	<A
n-Butanol	40	M
	30	E
	20	<A
Iso-Butanol	40	Q
Acetone	40	In
Methyl-ethylketone	40	In
M.I.B.K	40	In
Ethylacetate	40	In
Isobutylacetate	40	In
n-Heptane	40	In
Nitropropane	40	In
Toluene	40	In
I P A / n-Hexane=1 ：1	40	D~ E
	30	<A
	20	<A
Ethylalcohol / Isopropanol=1：3	40	Gel
	30	C
	20	<A
Ethylalcohol / Isopropanol=1：1	40	Gel
	30	In
	20	In
Isopropanol/Toluene/Ethylacetate=1：1：1	40	D~E
	30	<A
	20	<A

*The alphabets above are for the Gardner-Holdt Scale, at 20~22 ℃.

*In = Insoluble, Gel =Gelled.

An optimum solvent release(=drying,) rate can be attained by the proper combination of the solvent.

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4：Low Temperature Characteristics

TOHMIDE 394-N solutions may become gelled when subjected to low temperature for a long time.

5：Factors to influence gelation

(1)：Concentration(N.V.%) of the solution;

TOHMIDE 394-N and the solvent system has the optimum balance for low temperature stability.

(2)：Type of the solvent , or solvent system;

－A mixed solvent system of alcohol(s) and hydrocarbon(s), in general, give better stability at lower environmental temperature compared with any single solvent.

－Thus, when the resin content is the same, a solution of toluene and propanol mixture is more stable and retains fluidity far more down to the low temperature range than dose the one which contains either alcohol(s) or hydrocarbon(s) as the sole solvent.

－Alcohol have more solubility than any other conventional solvents for TOHMIDE 394-N. Among alcohols, those of linear carbon-carbon structure (=normal alcohols,) produce more stability than do those of branched chain(=Iso alcohol,).

－Also , the longer the carbon chain , generally the better is the anti-gelling property at low temperature.

For example , among solution of the same N.V.%,

The one of xylene-butanol shows better stability than that of toluene-propanol (=normal,) which is in turn still more stable than that of toluene-isopropanol combination, provided the ratios of the each pair of solvents are all the same.

In this case, the xylene-butanol solution shows a higher solution viscosity in the room temperature range, compared with the toluene-IPA system of the same resin content. However , as the environmental temperature goes down, toluene-IPA solution gel at a higher temperature than does the xylene-butanol system.

－The level of solution viscosity at the room temperature (i.e.,at 25℃ range) does not seem to have much to do with the low temperature characteristics of the solution.

－Aromatic hydrocarbons usually give more stability than the aliphatic hydrocarbons do.

6：Solution viscosity and low temperature stability

TOHMIDE 394-N is dissolved at the 40% resin concentration in the mixed solvents of toluene and isopropanol (IPA) blend at several different ratios. Each varnish was then subjected to the designed temperature for 24 hours, and solution stabilities under low temperature were observed;

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Solvent system ratio	Bubble Viscosity(25℃ Gardner-Holdt)	Stability	
		10℃	5℃
8 / 2	H	HG	HG
6 / 4	F	SG	HG
4 / 6	F	HG	HG
2 / 8	G ~ H	HG	HG

SG = Soft gel HG = Hard gel

Similar tests as above were conducted in a mixed solvent system of toluene ：IPA：ethylactate =2：2：1 in weight . In this case , the resin content (N.V.%) was made defference.

N.V.%	Bubble Viscosity(25℃ Gardner-Holdt)	Stability		
		15℃	10	5℃
40	E	HG	HG	HG
30	<A	F	PG	HG
20	<A	F	F	PG

F = Remains in solution form (fluid)
PG = Partially gelled HG = Hard gel

7：Gel recovery time of TOHMIDE 394-N **in the mixed solvent system of toluene / isopropanol / ethylacetate.**

TOHMIDE 394-N solutions of various resins contents(N.V.%) in a solvent system of toluene / IPA / ethylacetate = 2：2：1 in weight ,have been kept at 10℃ for 24 hours. Afterwards, some of the samples become gelled , and those cold gels were then kept at the room temperature of 20℃ where the time (in minutes,) needed to recover original fluidity were observed as follows;

N.V.% of TOHMIDE 394-N	Gel recovery time (in minutes)
40	400
30	30
20	F

F = not gelled at 10℃.

8：Selection of pigments and dyes

TOHMIDE 394-N is very low in the chemical reactivities as seen by the low acid , and amine values, so that practically no particular pigments and dyes are to be avoided for use in the TOHMIDE 394-N based ink formulations.

Pigment：Pigments of high acidity should be refrained.

Dyes ：Dyes to be employed must be soluble type.

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Pigments and dyes for TOHMIDE 394-N based ink should not contain any manganese and/or cobalt components, as those colourant are likely to cause deterioration of the ink film after printing due to oxidation.

This deterioration results in blocking of the ink film as well as bad odor.

Example of formulation：

For rotogravure ink：

TOHMIDE 394-N	23 parts
Organic pigment	10
Nitrocellulose H 1/4s	4
Toluene	37
Isopropylalcohol(IPA)	16
Ethylacetate	10
Anti-oxidant (B.H.T)	0.1
Anti-oxidant (D.L.T.P)	0.1

*D .L .T.P =DILAURYL THIODIPROPIONATE

$S[(CH_2CH_2COO(CH_2)_{11}CH_3)]_2$

9：Individual characteristics of TOHMIDE 394-N

The viscosity , heat resistance (heat blocking resistance) , oil resistance , and soap resistance are measured as follows when employ cyanine blue as organic pigment into the TOHMIDE 394-N resin, in accordance with the formulation given for the rotogravure inks.

Viscosity of inks：30 sec. at 18℃ , by Zahn Cup NO.4

Heat blocking resistance ：

Heat blocking resistance of inks printed on two ply of aluminium foil were measured as follows , by pressing them at each specified temperature by Heat-Sealing Test Machine.

Press load：1 kgf /cm^2

Press time： 1 second

(a) In case of Face to Face;

Temperature on the Heat-Sealing Bar				
100℃	110℃	120℃	130℃	140℃
G	G	PB	B	B

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(b) In case of Face to Glassine paper;

Temperature on the Heat-Sealing Bar				
100℃	110℃	120℃	130℃	140℃
G	G	PB	PB	B

G = good PB = partially blocking B = totally blocking.

Oil resistance ：Good .

Smear ink films printed on the treated polyethylene films with margarine , and leave them alone for 24 hour at room temperature. Abrasion test was conducted after wiping down margarine on the ink films.

Load ：250 grs.

Frictional oscillation ：100 times.

Soap resistance ：Excellent .

Immerse ink films printed on aluminium foil into one % of soap solution at room temperature ; and put them out after 18 hours to conduct the resistance .

Water resistance ：Excellent .

(a) Immerse ink films printed on treated polyethylene films in tap water for 16 hours, and then remove water to conduct Scotch Tape Test.

(b) Immerse ink films printed on treated polyethylene films in tap water for 16 hours, When wrinkle test was conducted using "Face-to Face" printed on the treated polyethylene films, and NO.s of wrinkle ; 20 times.

10：Formulations to enhance adhesion onto untreated polyolefin films

Example of formulation to enhance adhesion onto polyolefin (polyethylene and polypropylene, etc.,) films is as follow, although no adhesion is generally believed when polyamide resins are employed onto untreated films.

Example of formulation：

TOHMIDE 394-N	20 parts
Organic pigment	10
Dammargum	7
Palmitic acid amide wax	1
Toluene	54
Isopropylalcohol(IPA)	8
Anti-oxidant (B.H.T)	0.1
Anti-oxidant (D.L.T.P)	0.1
Total	100.2 parts