SANHO CHEMICAL CO., LTD.
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TOHMIDE 90

TOHMIDE 90 is a fatty polyamide resin synthesized by a polycondensation of mainly the dimerized fatty acid and the alkylenepolyamines.

1. Major Characteristics

TOHMIDE 90 shows superior adhesion onto wide variety of surface so that it is highly useful for rotogravure printing inks.

(1) Good solubility into various conventional industrial solvents.
(2) Superior adhesion onto many kind of substrates.
(3) Good wetting (=dispersion,) of the pigments and dyestuffs.
(4) Good resistance to water, oil and chemicals.
(5) Fast release of the solvent from the printed film.
(6) Smooth and hard film surface with high gloss.
(7) Good compatibility with nitrocellulose.
(8) Smooth and hard film surface with high gloss, which is suitable for over-printings.

2. Sales Specifications

Appearance	：Brown Yellow Pellets
Softening Point (Ball and Ring / ℃)	：115 ± 5
Viscosity (Gardner-Holdt/25℃)	：*A ~ E
Colour (Gardner)	：*10 Max
Acid Value (mg-KOH / gm)	：5 Max
Amine Value (mg-KOH / gm)	：3 Max
Sp. Gr.	：0.98.

3. Solubility Data

Solvent	TOHMIDE 90	
	Resin Content (%)	Solubility
Ethyl-alcohol	40	Gel
Ethyl-alcohol	30	Gel
Ethyl-alcohol	20	Gel
Isopropanol (IPA hereafter)	40	Gel
Isopropanol	30	A
Isopropanol	20	＜A
n-propanol	40	D
n-propanol	30	＜A
n-propanol	20	＜A

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Solvent	TOHMIDE 90	
	Resin Content (%)	Solubility
n-Butanol	40	D
n-Butanol	30	＜A
n-Butanol	20	＜A
Iso-Butanol	40	E
Acetone	40	In
Methyl-ethylketone	40	In
M.I.B.K.	40	In
Ethyl acetate	40	In
Isobutylacetate	40	In
n-Heptane	40	In
Nitorpropane	40	In
Toluene	40	In
IPA / n-Hexane (：1 / 1)	40	B
IPA / n-Hexane (：1 / 1)	30	＜A
IPA / n-Hexane (：1 / 1)	20	＜A
Ethyl-alcohol / Isopropanol (：1 / 3)	40	B
Ethyl-alcohol / Isopropanol (：1 / 3)	30	＜A
Ethyl-alcohol / Isopropanol (：1 / 3)	20	＜A
Ethyl-alcohol / Isopropanol (：1 / 1)	40	A
Ethyl-alcohol / Isopropanol (：1 / 1)	30	＜A
Ethyl-alcohol / Isopropanol (：1 / 1)	20	＜A
Isopropanol / Toluene / Ethyl-acetate (：1 / 1 / 1)	40	A
Isopropanol / Toluene / Ethyl-acetate (：1 / 1 / 1)	30	＜A
Isopropanol / Toluene / Ethyl-acetate (：1 / 1 / 1)	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.

4. Low Temperature Characteristics

TOHMIDE 90 solutions may become gelled when subjected to low temperature for a long time.

5. Factors to influence gelatin

(1) Concentration (NV %) of the solution

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(a) TOHMIDE 90 and the solvent system has the optimum balance for low temperature stability.
(b) Lower (lesser) solid percentage does not necessary mean more stability.

(2) Type of the solvent, or solvent system
(a)A mixed solvent system of alcohol(s) and hydrocarbon(s), in general, give better stability at the lower environmental temperature compared with any single solvent.
(b)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 does the one which contains either alcohol(s) or hydrocarbon(s) as the sole solvent.
(c)Alcohol have more solubility than any other conventional solvents for TOHMIDE 90. Among alcohol, those of linear carbon-chain structure (= normal alcohol) produce more stability than do those of branched chain (= Iso alcohol).
(d)Also, the longer the carbon chain, generally the better is the anti-gelling property at low temperature.

For example, among solutions of the same NV %, 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 the 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 resins content.
However, as the environmental temperature goes down, toluene-IPA solution gell at a higher temperature than does the Xylene-Butanol system.

(e)The level of solution viscosity at the room temperature (ie., 25℃range) does not seem to have much to do with the low temperature characteristics of the solution.
(f)Aromatic hydrocarbons usually give more stability than the aliphatic hydrocarbons do.

6. Solution viscosity and low temperature stability

TOHMIDE 90 is dissolved at the 40% resin concentration in the mixed solvents of toluene and isopropanol (= IP0A) blend at several different ratios.
Each varnish was then subjected to the designated temperature for 24 hours, and the solution stabilities under low temperature were observed.

Solvent system	Bubble Viscosity (25℃, Gardner-Holdt)	Stability	
		10℃	5℃
8 / 2	A ~ B	HG	HG
6 / 4	A ~ B	F	SG
4 / 6	A ~ B	HG	HG

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2 / 8	B	HG	HG

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

NV %	Bubble Viscosity (25℃, Gardner-Holdt)	Stability		
		15℃	10℃	5℃
40%	A	SG	HG	HG
30%	＜A	F	F	SG
20%	＜A	F	F	F

* F = Remains in solution form (fluid).
* PG = partially gelled.
* SG = soft gel.
* HG = hard gel.

7. Gel recovery time of Tohmide 90 in the mixed solvent system of toluene / isopropanol / ethylacetate.

TOHMIDE 90 solutions of various resins contents (= NV %) 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 90	Gel recovery time
40%	390 min
30%	F
20%	F

* F = not gelled at 10℃

8. Selection of Pigments and dyes

TOHMIDE 90 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 90 based ink formulations.

Pigment ：Pigments of high acidity should be refrained.
Dyes ：Dyes to be employed must be soluble type.

Pigments and dyes for TOHMIDE 90 based ink should not contain any manganese and or cobalt components, as those colorant 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.

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9. Example of formulation：(For flexogravure ink)

TOHMIDE 90	23.0	parts
Organic pigment	10.0	parts
Nitrocellulose H 1/8s	4.0	parts
Isopropyl alcohol (IPA)	35.0	parts
Isopropyl acetate	10.0	parts
Anti-Oxidant (BHT)	0.1	parts
Anti-Oxidant (DLTP)*	0.1	parts
Total	100.2	parts

*DLTP = Dilauryl thiodipropionate

*S：$(CH_2\ CH_2CO_2C_{12}H_{25})_2$

10. Individual characteristics of TOHMIDE 90

The viscosity, heat resistance (heat blocking resistance), oil resistance, and soap resistance are measured as follows when employ cyanide blue as organic pigment into the TOHMIDE 90 resin, in accordance with the formulation given for the rotogravure inks.

(1) Viscosity of Inks：23sec. at 18℃, by Zahn Cup No.4

(2) Heat blocking resistance：Heat blocking resistance of inks printed on two ply of aluminum 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：

Tohmide 90	Temperature on the Heat-Sealing Bar				
	100℃	110℃	120℃	130℃	140℃
	G	G	PB	B	B

(b)In case of Face to Glassine paper：

Tohmide 90	Temperature on the Heat-Sealing Bar				
	100℃	110℃	120℃	130℃	140℃
	G	PB	B	B	B

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

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(3) Oil resistance：(Good)

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

(4) Soap resistance：(Excellent)

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

(5) 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, where wrinkle test was conducted using " face-to-face " printed on the treated polyethylene films, and Nos. of wrinkle：20 times.

11. Formulation for high performance inks

When high performance inks are claimed, following formulation is to serve you superior heat resistance, water resistance, chemical resistance and blocking resistance.

Example of the formulation：

TOHMIDE 90	23.0	parts
Organic Pigment	10.0	parts
Nitrocellulose H 1/4s	4.0	parts
Toluene	10.0	parts
Isopropyl alcohol	43.0	parts
Ethyl-acetate	10.0	parts
Anti Oxidant (BHT)	0.1	parts
Anti Oxidant (DLTP)	0.1	parts
Total	100.2	parts

All statements, technical information and recommendations listed herein are based on tests we believe to be reliable, but the accuracy or completeness thereof is not guaranteed.