NIPPON SHOKUBAI CO., LTD.

HYBRID MONOMER
VEEA

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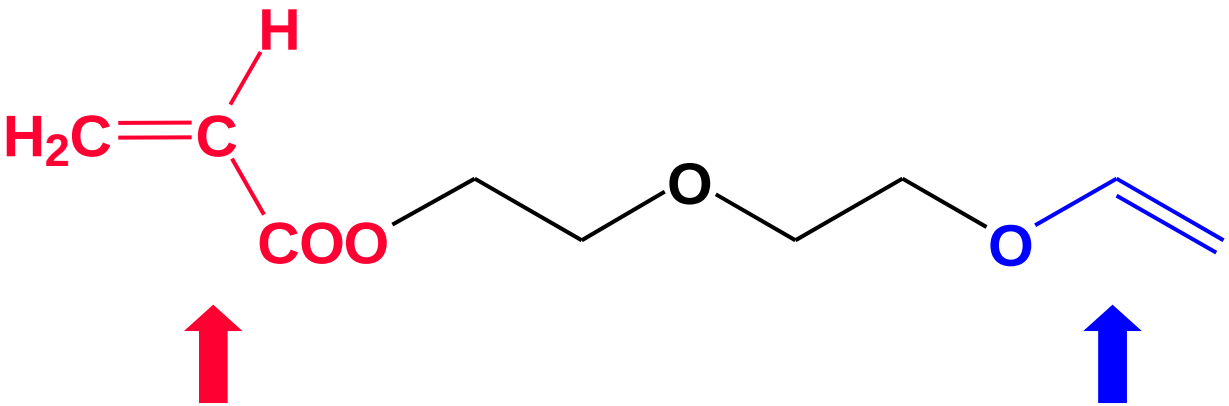
HYBRID MONOMER

2-(2-Vinyloxyethoxy)ethyl acrylate (VEEA)



radical curable

acryloyl group

- **not inhibited by moisture and bases**
- **many co-curable monomers**
- **no dark reaction**

cationic curable

vinylether group

- **not inhibited by oxygen**
- **good dilution**
- **good adhesion**
- **low skin irritating**

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Feature

◆VEEA has different kinds of polymerizable groups such as radical polymerizable acryloyl group and cationic polymerizable vinylether group installed in one molecule.

◆Reactive Polymers having acryloyl group or vinylether group are obtained from VEEA by selecting polymerization method.

◆VEEA shows high performances in radiation curable formulations.

◆VEEA shows high dilution performances.

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Properties

	VEEA
CAS No.	86273-46-3
Chemical formula	$C_9H_{14}O_4$
Molecule weight	186.20
Appearance	Colorless liquid
Boiling point	115-116 ℃/ 13.3 hPa
Density	1.04 g/ml (15 ℃)
Viscosity	3.65 mPa·s
Solubility in H_2O	18 g/L (30 ℃)

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Toxicological Information

	VEEA
Acute toxicity (Oral-Rat)	LD_{50} 1908 mg/kg
Mutagenic effects	negative in the AMES test
Primary Irritation Index	P.I.I. = 2.00
Eye Irritation	Non irritant
Biodegradability	82.1 % (BOD)

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Regulation

Country	Status	Remark / Specific status
Japan	ENCS: (2)-4028	
China	Registered under MEP Order No.7 (as New chemical)	Not listed in IECSC
Korea	Phase-in substance under K-REACH (2011-3-5146)	Non toxic substance
Australia	AICS: listed	
New Zealand	NZIoC: listed	May be used as a component in a product covered by a group standard but it is not approved for use as a chemical in its own right.
Philippine	PICCS: not listed	
USA	TSCA inv.: listed	SNUR*
Canada	DSL: listed	
EU	Registered under REACH (as Non Phase-in Substance)	Tonnage band: 100-1000T/Y
Switzerland	Registered under ChemV	Not listed in EINECS
Taiwan	TCSI: listed	

As of 30th June 2016

* The conditions of SNUR for VEEA are as shown below.
a) Making MSDS, b) Making Label, c) Wearing of gloves,
d) Making Hazard Communication Program,
e) Record Keeping

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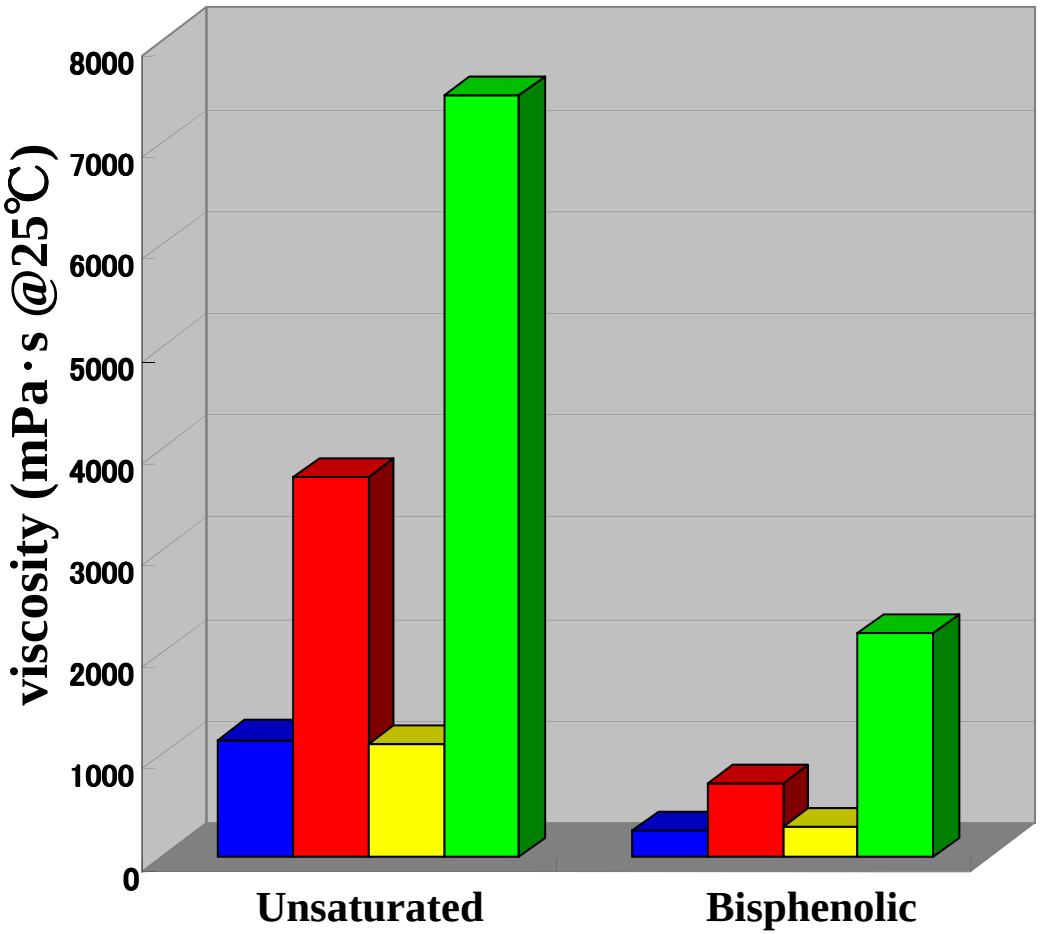
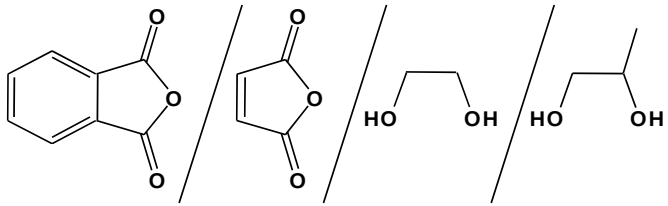
Dilution Performances

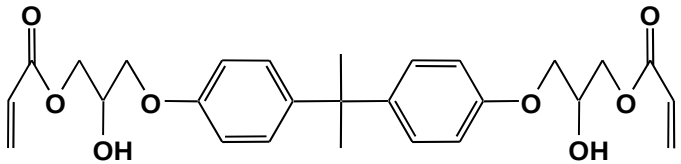


resin / diluent = 60 / 40 (wt / wt)

Unsaturated polyester resin



Bisphenolic epoxy acrylate resin



- VEEA
- Diethyleneglycol diacrylate
- N-Vinyl pyrrolidone
- Acryloylmorpholine

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UV Curing Performance of VEEA

Run No.		1	2	3
VEEA		100	-	-
Diethyleneglycol diacrylate		-	100	53.53
Diethyleneglycol divinyl ether		-	-	46.47
Irgacure907		1	1	1
UV curing performance [1)]	0.2 J/cm^2	-	-	--
	0.3 J/cm^2	++	+	--
	0.5 J/cm^2	++	+	--
UV curing performance [2)]	once	++	-	--
	twice	++	-	--
	5 times	++	-	--

1) UV radiation device: PM25C-100 (Ushio Inc.) with 250 W ultrahigh-pressure Hg vapor lamp,
Thickness: 300 µm, Surface tackiness: evaluated by finger touch (++ = loss of tack, -- = not cured)

2) UV radiation device: UB031-5BM (EYEGRAPHICS Co., Ltd.) with 80 W high-pressure Hg vapor lamp,
Thickness: 30 µm, Line speed: 14 m/min, Distance between lamp and substance: 10 cm,
Radiation energy of one time: 125 mJ/cm^2,
Surface tackiness: evaluated by finger touch (++ is loss of tack, -- is not cured)

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UV Curing Performance as Reactive Diluent

Run No.		8	9	10	11
Unsaturated polyester resin		60	60	-	-
Bisphenolic epoxyacrylate resin		-	-	60	60
VEEA		40	-	40	-
Diethyleneglycol diacrylate		-	40	-	40
Irgacure907		1	1	1	1
Viscosity (mPa·s at 25℃)		1102	2670	295	855
UV curing performance [2]	1 time	+	-	-	-
	2 times	+	-	++	++
	4 times	++	+	++	++
	5 times	++	+	++	++
Pencil hardness (JIS K-5400)		F	B	F	F
Acetone resistance (100 times)		++	++	++	++

2) UV radiation device: UB031-5BM (EYEGRAPHICS Co., Ltd.) with 80 W high-pressure Hg vapor lamp,
Thickness: 30 µm, Line speed: 14 m/min, Distance between lamp and substance: 10 cm,
Radiation energy of one time: 125 mJ/cm^2,
Surface tackiness: evaluated by finger touch (++ is loss of tack, -- is not cured)
Pencil hardness: evaluated after 10 times cured
Acetone resistance: evaluated after 10 times cured (++ = no change in gloss, -- = complete loss of gloss)

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Adhesion Performance of VEEA

	1	2	3	average
ABS	100/100	100/100	100/100	100/100
PS	100/100	100/100	100/100	100/100
PC	100/100	100/100	100/100	100/100
PMMA	81/100	83/100	91/100	82/100
PVC	39/100	50/100	52/100	47/100
PP	0/100	0/100	0/100	0/100
Glass	0/100	0/100	0/100	0/100
Copper	0/100	0/100	0/100	0/100

VEEA/Irgacure819/Irugacure369 = 94/2/4 (wt ratio)

UV radiation device: PM25C-100 (Ushio Inc.) with 250 W ultrahigh-pressure Hg vapor lamp,

Thickness: 300 µm

Energy: 1.0 J/cm^2

Adhesion Performance: JIS K 5600-5-6 (ISO 2409) Crosscut method

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