NIPPON SHOKUBAI CO., LTD.

HYBRID MONOMER
VEEA™

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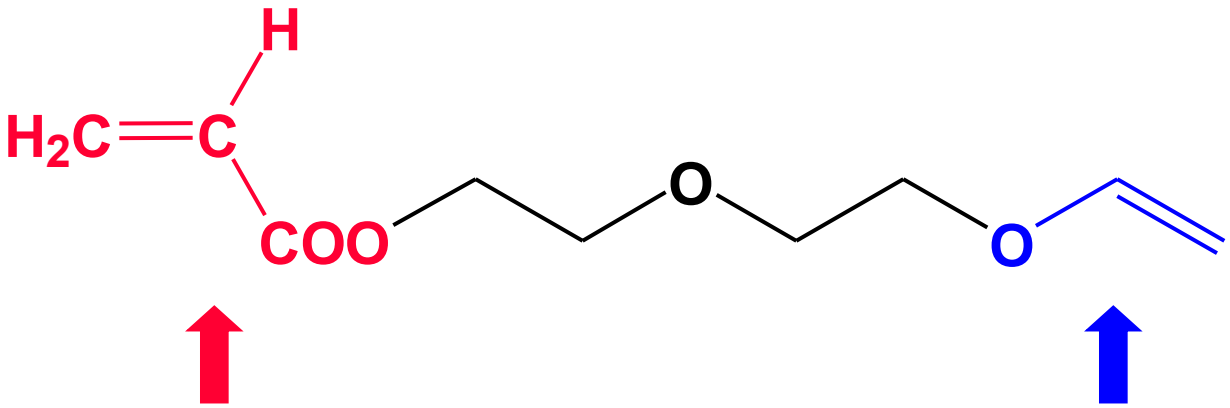
2-(2-Vinyloxyethoxy)ethyl acrylate (VEEA™)



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

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.

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 ℃)

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)

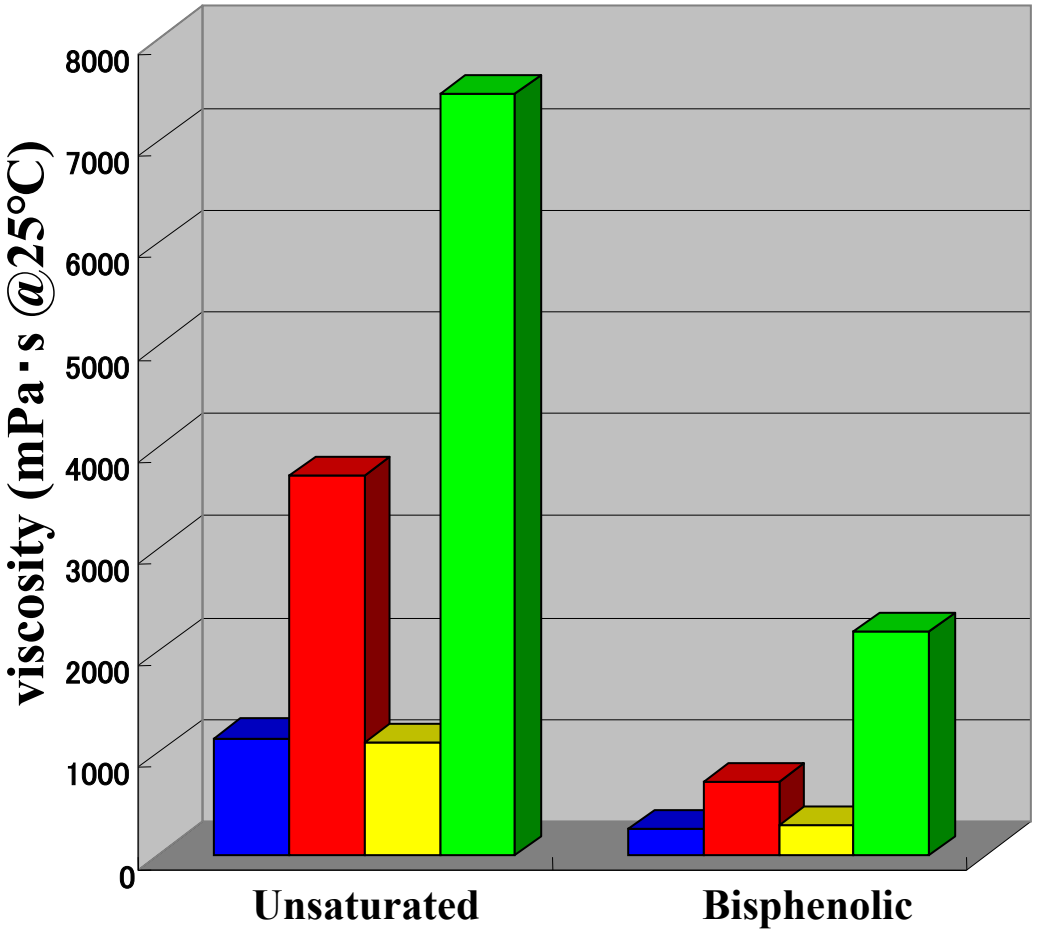
Regulation

Country	Status	Remark / Specific status
Japan	ENCS: (2)-4028	
China	IECSC: listed	
Korea	Phase-in substance under K-REACH	Non toxic substance
	(2011-3-5146)	
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	Tonnage band: 100-1000T/Y
	(as Non Phase-in Substance)	
Switzerland	Registered under ChemV	Not listed in EINECS
Taiwan	TCSI: listed	

As of 7th June 2019

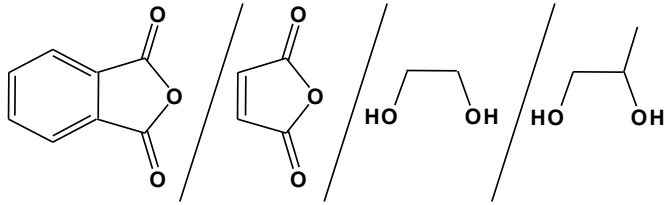
* The conditions of SNUR for VEEA are as shown below.
  a) Making MSDS, b) Making Label, c) Wearing of gloves,
  d) Making Hazard Communication Program,
  e) Record Keeping

Dilution Performances

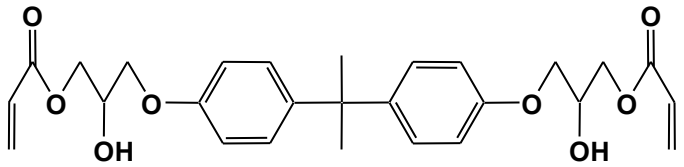


resin / diluent = 60 / 40 (wt / wt)

Unsaturated polyester resin



Bisphenolic epoxy acrylate resin



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

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)

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)

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