

SAN ESTERS CORPORATION

- SPECIALTY MONOMERS

SAN ESTERS CORPORATION

- San Esters was formed in 1989
- Joint venture of Mitsubishi Chemical America, Osaka Organic Chemical and Kowa American
- Sells and markets a wide variety of Acrylate, Methacrylate, and Acrylamide Monomers in North America

SAN ESTERS CORPORATION

- Our name is derived from “San” the Japanese word for the number three, representing the 3 owners; Mitsubishi Rayon (50%), Osaka Organic Chemicals (40%) and Kowa American Corp. (10%)
- “Esters” which is the predominant chemical structure of our monomers
- 1-800-3ESTERS (1-800-337-8377)

Mitsubishi Rayon America

- Mitsubishi Chemical America is the US subsidiary of Mitsubishi Chemical Corp (MCC), formerly Mitsubishi Rayon Corp.
- MCC is a large petrochemical, synthetic fiber and plastics producer founded in 1933 to originally produce rayon fiber
- Largest producer of Methyl Methacrylate (MMA) in the world using Acetone Cyanohydrin Synthesis, Isobutylene (C4) Oxidation, and now ethylene based ALPHA

Mitsubishi Chemical America

- MMA is produced in large amounts in factories in Europe, Asia and the USA
- MCC purchased Lucite International in 2009, almost doubling their MMA capacity
- Lucite acquisition also involved obtaining Lucite's new proprietary Alpha technology using ethylene as a low cost raw material.
- MCC has MMA production in Japan, China, Korea, Thailand, and Europe.

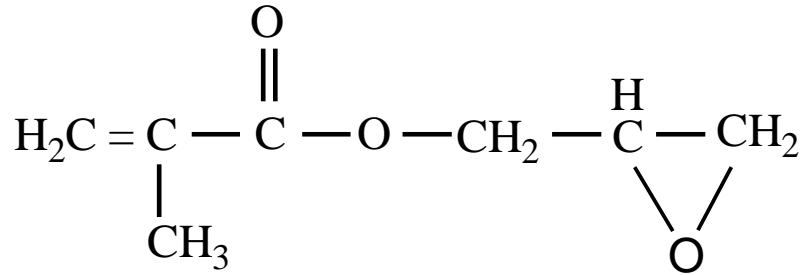
San Esters & Mitsubishi Chemical

- Mitsubishi Chemical is a major world manufacturer of specialty methacrylate esters derived from both MMA & MAA
- San Esters has been supplying these specialty monomers into the USA coatings, adhesives and specialty chemical industries
- MMA, Methacrylic Acid (MAA), Butyl Methacrylate (BMA), EHMA and Ethyl Methacrylate are handled by our sister company, Lucite in the USA

San Esters & Mitsubishi Chemical

- Major Specialty Methacrylates include:
 - Glycidyl Methacrylate (GMA)
 - Allyl Methacrylate (AMA)
 - Isobornyl Methacrylate (IBXMA)
 - tert-Butyl Methacrylate (tBMA)
 - Hydroxyethyl Methacrylate (HEMA)
 - Cyclohexyl Methacrylate (CHMA)
 - Stearyl Methacrylate (SMA)
 - and approximately 40 additional monomers

Glycidyl Methacrylate

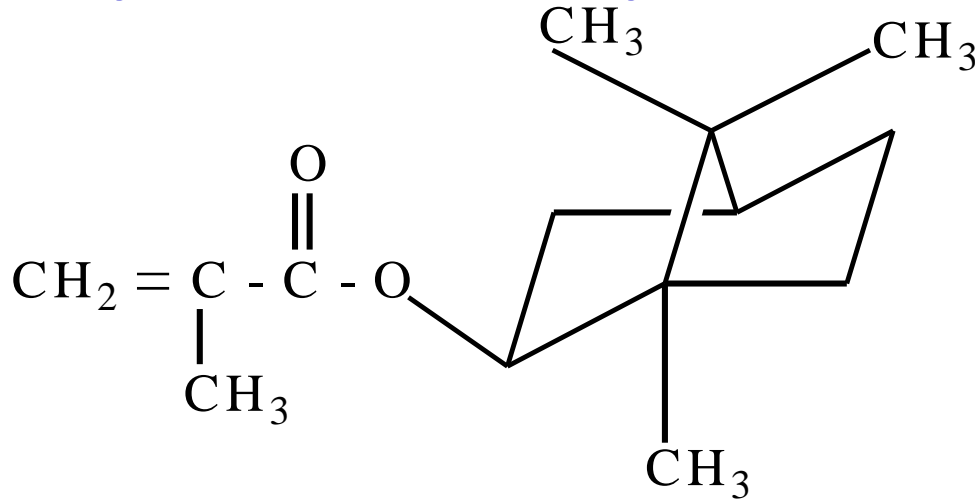


- Glycidyl Methacrylate is a unique monomer that allows chemists the ability to put Oxirane or Epoxy Groups into acrylic resins, thereby allowing a variety of further crosslinking or curing reactions
 - Purity 98% min.
 - Tg 46 °C
 - Corrosive Liquid
 - Available in drums or bulk trucks

tert-Butyl Methacrylate (TBMA)

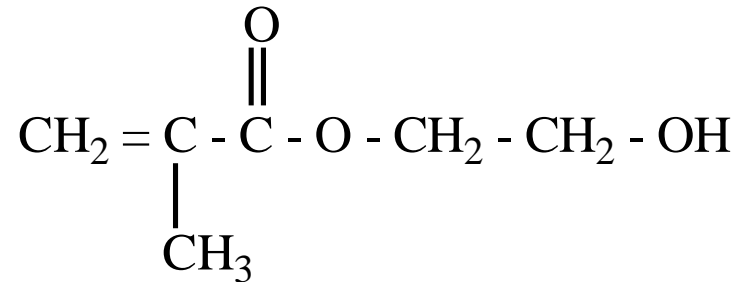
- High Tg monomer (107°C) similar to MMA (105°C), but with substantially better solubility parameter for higher solids content, lower viscosity resins and better compatibility with “leaner” oxygenated solvents
- Imparts dramatic UV and moisture resistance to resins for superior gloss retention
- Please see our TBMA technical brochure in download section for complete details

Isobornyl Methacrylate (IBXMA)



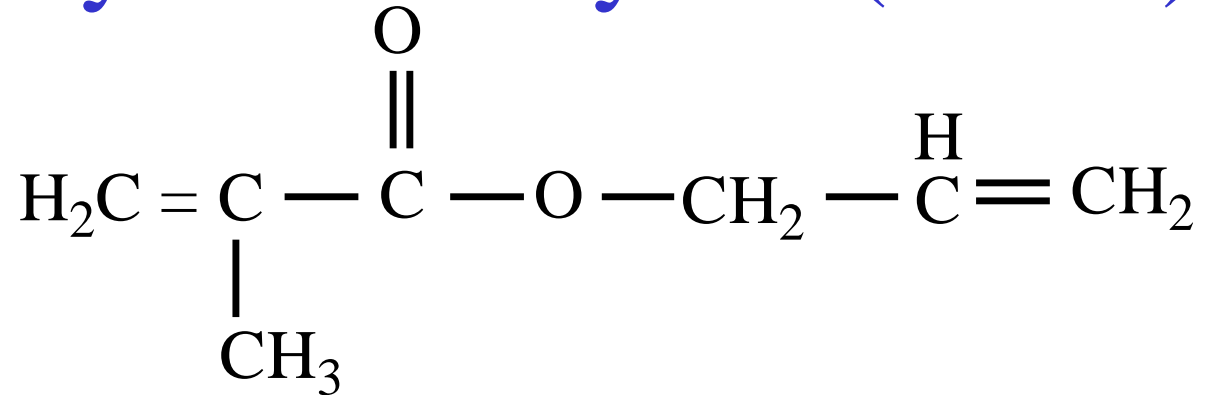
- Isobornyl Methacrylate is a high T_g (glass transition temp.) Monomer useful in imparting hard toughness into acrylic resins
- Low color (10 APHA) and no phenothiazine inhibitor (a potent color former) allows its use in clear hardcoats
- A variety of T_g have been reported from 111 °C - 175 °C
- Relatively non-toxic and non-corrosive

Hydroxyethyl Methacrylate (HEMA)



- HEMA is a water soluble monomer that can be used to impart Hydrophilicity into acrylic resins. Water soluble resins can be prepared or alternatively Hydrogels such as those for soft contact lenses.
- HEMA can be used in solvent borne and water borne coatings.
- We have a special low acidity monomer (Typically 0.01%)
 - Purity 97% min. Tg 55 °C
 - Non-corrosive and non-toxic monomer
 - available in drums or bulk

Allyl Methacrylate (AMA)



- Allyl Methacrylate can be polymerized into acrylic resins by group transfer polymerizations or other polymerization schemes that selectively polymerize the methacrylate double bond while leaving the Allyl group alone.
- Can be used as a crosslinking monomer for a variety of acrylic and vinyl resins.
- AMA is available in bulk or drums and is considered toxic by all routes of entry (also flammable)
- Tg is 52 °C and purity is typically 99.9%

Osaka Organic Chemicals

- Osaka Organic Chemicals (OOC) was established in 1941 originally for the manufacture of synthetic fragrances and specialty chemicals
- Produce a wide variety of specialty chemicals, solvents, photoresists, coating resins and hair care resins
- OOC is a high technology company with over 20% of staff involved in research and development

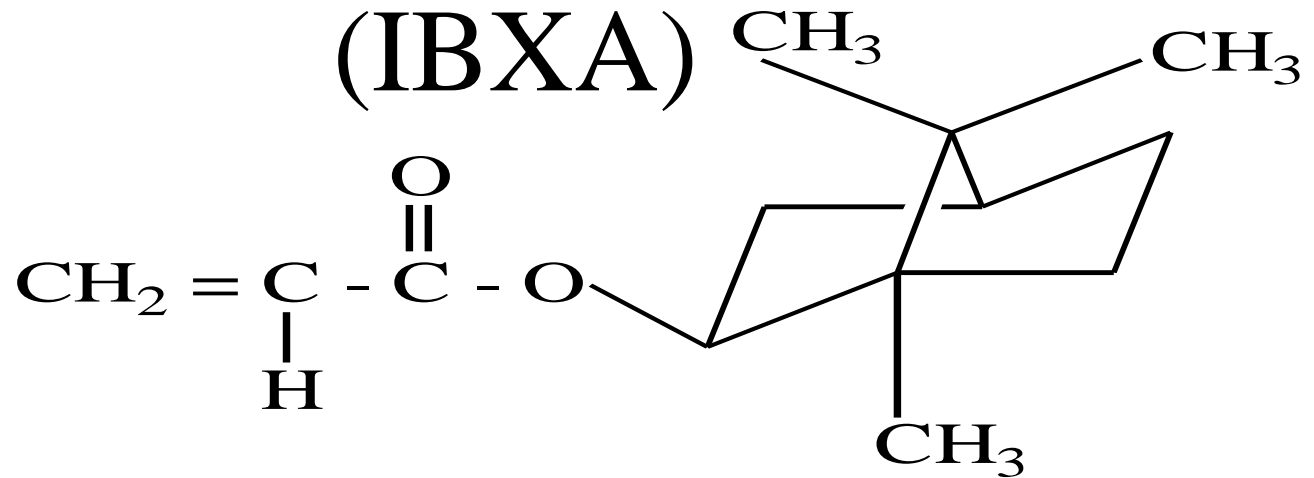
San Esters & Osaka Organic

- OOC's largest product line is acrylate monomers, which San Esters offers into the US market as a natural complement to MRC's Methacrylates
 - Isobornyl Acrylate (IBXA)
 - 4-Hydroxybutyl Acrylate (4HBA)
 - Methoxy Polyethylene Glycol Monoacrylate (MPEG Acrylate)
 - Stearyl Acrylate (STA)
 - Polybutadiene Diacrylate (BAC-45)

San Esters & Osaka Organic

- tert-Butyl Acrylate (tBA)
- 2-Hydroxyethyl Acrylate (HEA)
- 2-Ethoxyethyl Acrylate (2ETA)
- Pentaerythritol Triacrylate (PET3A)
- Phthalic Acid & other acid function acrylates
- Fluorinated Acrylates and Methacrylates
- Over 100 different acrylate and methacrylate monomers

ISOBORNYL ACRYLATE

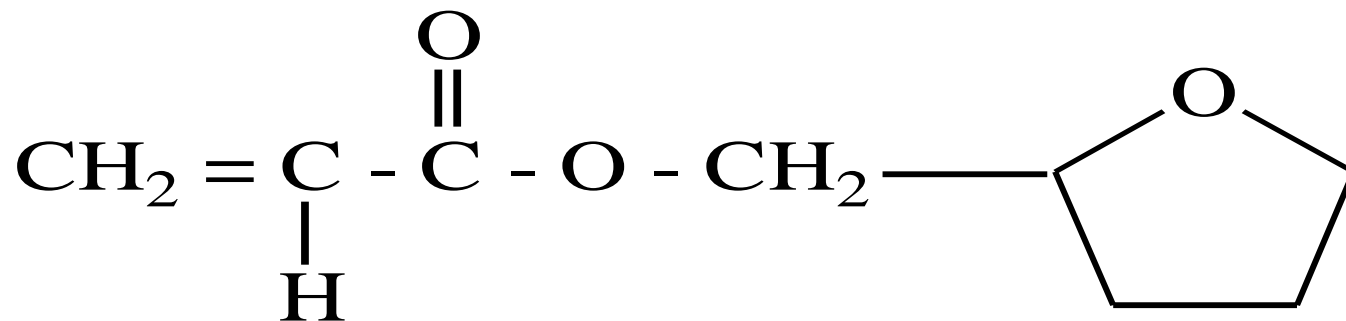


Primarily used as a diluent monomer in radiation curable formulations to increase abrasion resistance, gloss and hardness

IBXA is a low viscosity (2.6 cps), High Tg (94 deg °C) monomer

Useful in conventional coating and adhesive resins for increasing Tg where methacrylate monomers are not reactive enough
Low color (< 30 APHA) and no phenothiazine (PTZ) present

TETRAHYDROFURFURYL ACRYLATE (THFA)

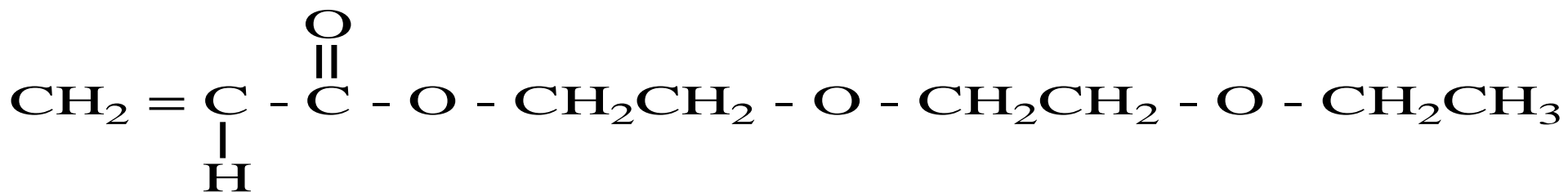


*Low viscosity (2.8 cps) Cyclic Ether functional Diluent monomer with excellent solvency with other monomers and oligomers

*Has moderate Tg (-12 deg °C) compared to ethylene glycol ether based monomers

*Highest purity (> 97%) available commercially worldwide, also results in a lower irritation index compared to competitors. Draize or primary irritation Index (P.I.I) of 5.0 for moderate irritation allows its in UV curable formulations

ETHOXYETHOXY-ETHYL ACRYLATE (EEEA)

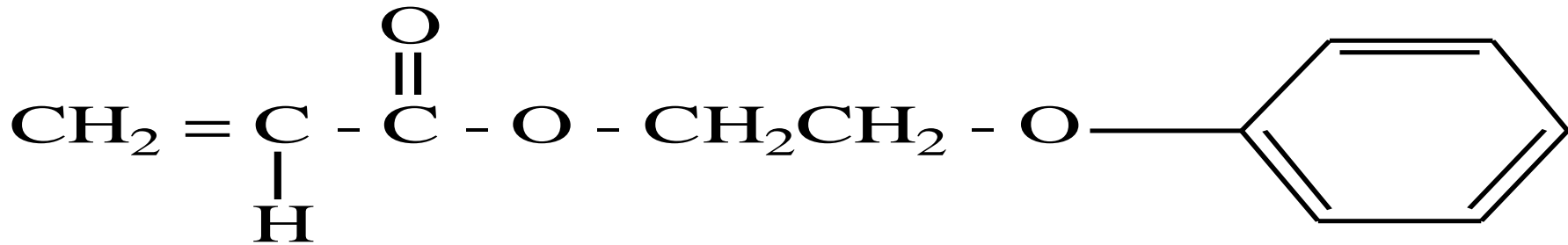


Low viscosity (2.9 cps) , Low Tg (-67 deg °C) diluent monomer. Highest purity (over 97%) commercially available

Low color and excellent wetting properties with various substrates and co-monomers.

A variety of other glycol Ether monomers also available

PHENOXYETHYL ACRYLATE (PEA)



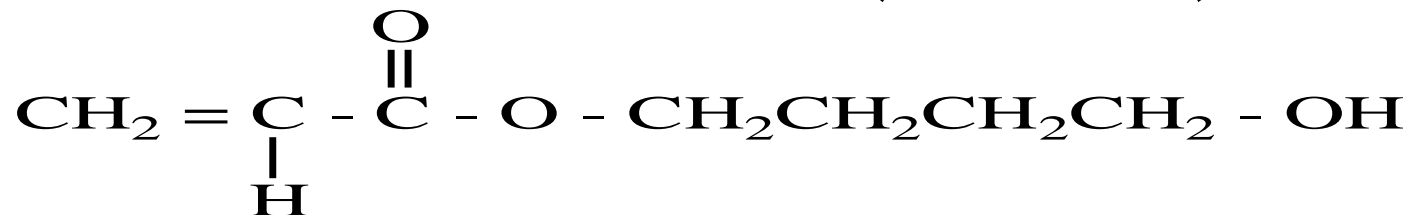
Aromatic diluent monomer for uv/eb curing applications

Low viscosity (3.3 cps) and low Tg (-22 deg °C)
monomer

More compatible with hydrophobic and/or organophilic
resins and monomers than other ether functional diluent
monomers

Highest purity (> 98%) available commercially

4-HYDROXYBUTYL ACRYLATE (4HBA)



ALSO KNOWN AS 1,4-BUTANEDIOL MONOACRYLATE

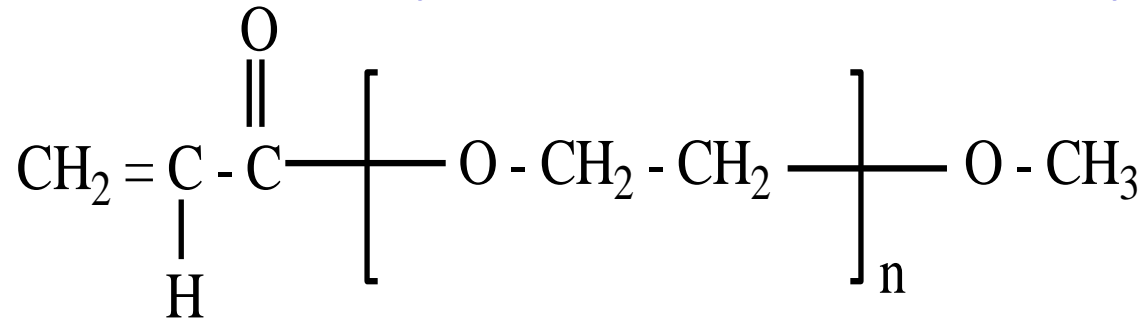
LOW T_g HYDROXY MONOMER (-32 DEG °C) FOR INCREASED FLEXIBILITY AND SOFTNESS. CHAIN LENGTH OF PENDANT HYDROXY GROUP IN 4HBA IS ALMOST TWICE THAT OF HEA/HPA

LOW DIACRYLATE CONTENT (< .5%) PREVENTS UNWANTED GELATION, VISCOSITY INCREASES OR CROSSLINKING

HYDROXY ACRYLATE CAN BE USED AS IS IN UV/EB CURING FORMULATIONS (DRAIZE OR P.I.I.= 3.0) OR TO END CAP SPECIALTY URETHANE OLIGOMERS

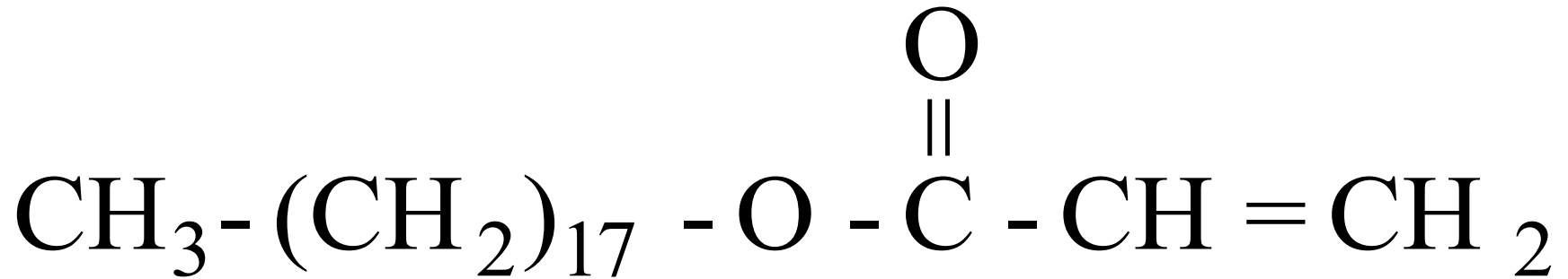
Methoxy Polyethylene Glycol Monoacrylate

(MPEG 400 Acrylate or MPEG550 Acrylate)



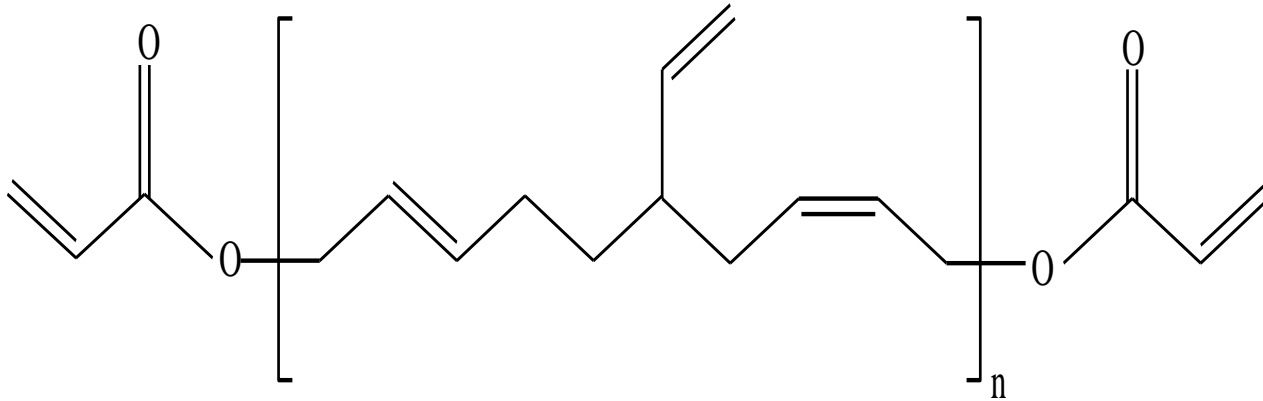
- These monomers impart a Hydrophilic Polyethylene Glycol chain onto acrylic polymers with a low Diacrylate content.
- High Diacrylate content can lead to gelation or unwanted crosslinking.
- Useful for waterborne coatings and adhesives with two molecular weights to choose from: 550 or 400

Stearyl Acrylate (STA)



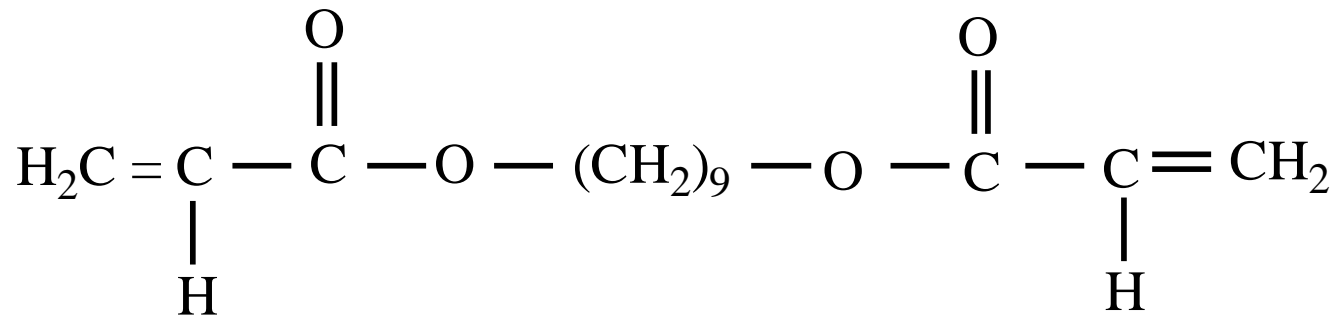
- Stearyl Acrylate is a soft waxy monomer used to impart hydrophobicity into acrylic or other resins
- The monomer melts around 30°C, so normally users would have to melt the monomer from the drums to use
- Our product is almost exclusively the C18 Ester (97% min.) with lesser amounts of C16 (1.5% max) and C20 (1.0% max) Esters.
- Useful in hydrophobic coatings (conventional and radcure), textile treatments, and release coatings

Polybutadiene Diacrylate (BAC-45)



- BAC-45 is a specialty Oligomer that can impart both Elastomeric and Hydrophobicity into polymer systems.
- Molecular weight is around 3,000 and is available as a clear viscous liquid.
- Non-hazardous and TSCA listed

1,9-Nonanediol Diacrylate (Viscoat 260)



- Viscoat 260 is a new monomer that is now on TSCA
- Low shrinkage and excellent crosslinking ability
- Low irritancy monomer (P.I.I. = 2.0) to replace 1,6-Hexanediol Diacrylate (HDDA) in UV formulations
- Low viscosity (21 mPa*s @ 25° C) for use as a diluent monomer
- Resins have excellent water resistance and good flexibility

New & Specialty Monomers

- These monomer in the slide show are our most popular monomers sold in the USA
- San Esters Corp. and our sister company Kowa American have access to hundreds of acrylate, methacrylate & acrylamide monomers
- Please call us if you are looking for a particular monomer or physical properties in a monomer or finished resin/oligomer
- Custom synthesis inquiries welcome