

Methacrylate Monomer

Methyl methacrylate / n-Butyl methacrylate / i-Butyl methacrylate / Methacrylic acid





LX MMA

LX MMA was established in 1991 as a joint venture of LG Chemicals, Japan's Sumitomo Chemical and Nippon Shokubai. Since the foundation in 1991, it completed 1st MMA plant in 1993. In 1999, it took over PMMA business of LG Chemicals, and 2nd MMA plant and PMMA plant were completed in 2003 and 2005 each. Also completing 3rd MMA plant in 2008, it became possible to produce 180,000 tons of MMA and 123,000 tons of PMMA in total.

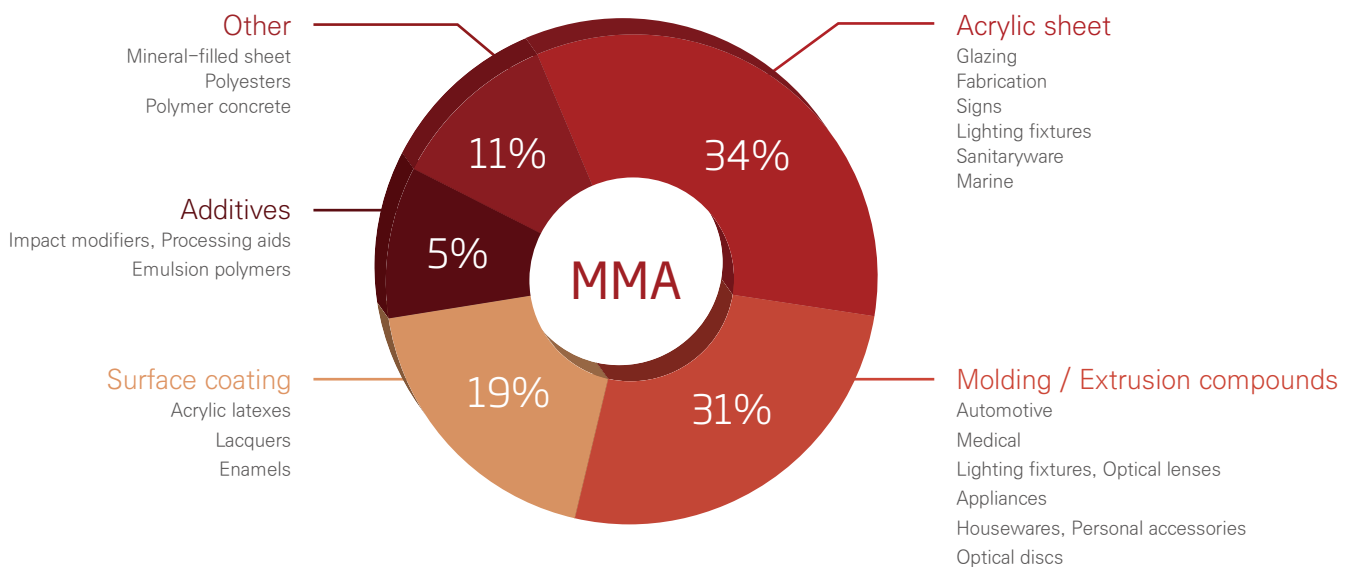
Our MMA plant has adopted the direct oxidation process of isobutylene industrialized and developed by Sumitomo Chemical and Nippon Shokubai. It does not generate any pollutant. And it is high-tech manufacturing process which can produce high quality MMA since it oxidizes isobutylene extracted from C4 in air and manufactures meth acrylic acid and esterifies it into methanol. And it finally makes MMA.

LX MMA which has been carrying forward the newly continuous and innovative activities is establishing the competitiveness of the world's level in quality and business through the improvement in production process, client services, and business process, etc. LX MMA is going to develop for our fertile lives and try a lot of effort to be the tip-topmost enterprise which jumps up to the world and the future with our clients.

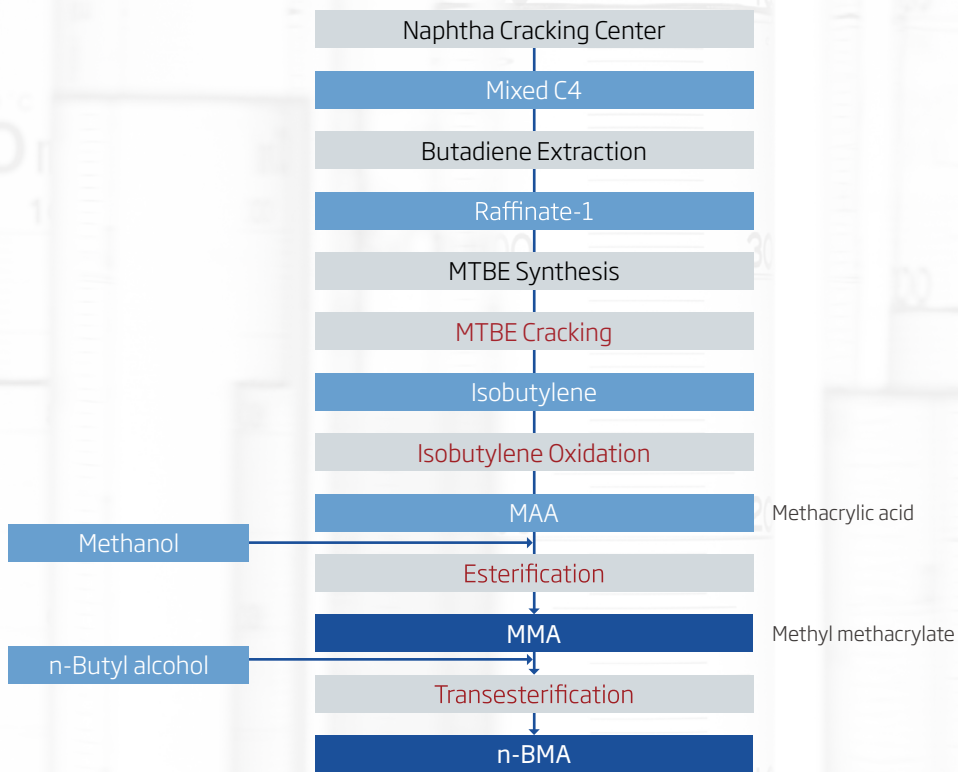
Production Capacity

Capacity	MMA	MAA	n-BMA	PMMA
	180,000MT/year	50,000MT/year	15,000MT/year	123,000MT/year

World Consumption of MMA (2021 CEH estimates)



Manufacturing Process



MTBE Cracking	$\text{CH}_3 - \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{O} - \text{CH}_3 \xrightleftharpoons{\text{catalyst}} \text{CH}_2 = \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} + \text{CH}_3\text{OH}$ <p>Methyl tert-butyl ether Iso-butylene Methanol</p>
Isobutylene Oxidation	$\text{CH}_2 = \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} + \text{O}_2 \xrightarrow[\Delta]{\text{catalyst}} \text{CH}_2 = \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{CHO} + \text{H}_2\text{O}$ <p>Iso-butylene Methacrolein</p> $\text{CH}_2 = \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{CHO} + \text{O}_2 \xrightarrow[\Delta]{\text{catalyst}} \text{CH}_2 = \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{COOH} + \text{H}_2\text{O}$ <p>Methacrolein Methacrylic acid</p>
Esterification	$\text{CH}_2 = \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{COOH} + \text{CH}_3\text{OH} \xrightleftharpoons[\Delta]{} \text{CH}_2 = \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{COOCH}_3 + \text{H}_2\text{O}$ <p>Methacrylic acid Methyl methacrylate</p>
Transesterification	$\text{CH}_2 = \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{COOCH}_3 + \text{C}_4\text{H}_9\text{OH} \xrightleftharpoons[\Delta]{\text{catalyst}} \text{CH}_2 = \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{COO}(\text{CH}_2)_3\text{CH}_3 + \text{CH}_3\text{OH}$ <p>Methyl methacrylate n-Butyl alcohol n-Butyl methacrylate Methanol</p>

MMA / BMA

Methyl methacrylate / n-Butyl methacrylate

MMA Specification

Item	Unit	Spec
Purity	wt%	99.8 Min.
Color (APHA)	-	5 Max.
Water	ppm	500 Max.
Acid (as MAA)	ppm	50 Max.
Inhibitor (Topanol-A)	ppm	5±1

*Topanol-A : 2,4-dimethyl-6-tert-butylphenol

BMA Specification

Item	Unit	Spec	
		n-BMA	i-BMA
Purity	wt%	99.6 Min.	99.0 Min.
Color (APHA)	-	5 Max.	10 Max.
Water	ppm	500 Max.	500 Max.
Acid (as MAA)	ppm	50 Max.	50 Max.
Inhibitor (Topanol-A)	ppm	15±2	10±2

*MEHQ : hydroquinone monomethyl ether

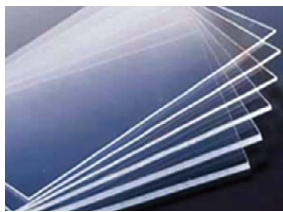
*Inhibitor content can be changed by request

Properties

Properties	Unit	MMA	n-BMA	i-BMA
Molecular weight	g/mol	100.1	142.2	142.2
Chemical formula	-	$\text{CH}_2=\text{C}(\text{CH}_3)\text{COOCH}_3$	$\text{CH}_2=\text{C}(\text{CH}_3)\text{COOC}_4\text{H}_9$	$\text{CH}_2=\text{C}(\text{CH}_3)\text{COOCH}_2\text{CH}(\text{CH}_3)_2$
Specific gravity at 20°C	g/cm ³	0.943	0.886~0.892	0.879~0.885
Boiling point	°C	100	163	155
Freezing point	°C	-48	-50	-35
Heat of polymerization	kcal/kg	137	95	96
Solubility (water)	g/100g	1.6	0.6	0.4
Flash point (closed cup)	°C	10	50	49
Auto-ignition point	°C	421	290	390
Limits of flammability	vol %	2.1~12.5	1.0~8.0	1.0~8.0

*The listed values should be used for reference purpose only.

MMA Applications



PMMA



Artificial marble



MMA polymer concrete



Transparent ABS



Casting Sheet



MBS



SB-Latex



Adhesives



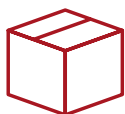
Paint

Handling & Use



Handling

- Wear and deal in the right protective gears
- Use only outdoors or in well-ventilated area
- Use equipment for explosion and block the originating of static electricity.
- Install the local ventilation system in handling site.



Storage

- Store drums away from incompatible materials, such as oxidizers, peroxides, and strong acids.
- Save in cool, inflammable, and well-ventilated site avoiding the direct sunlight.
- Keep the temperature less than 35°C. Temperatures above 35°C reduce the lifespan of the inhibitor and reduce shelf life.
- Install the drain near the storing site when saving in airtight container and also install the blocking device in the last exit of the drain for reducing the range of chemicals' leakage.
- Administer if the container leaks, rusts, or gets damaged.

MAA

Methacrylic acid

Specification

Item	Unit	Spec
Purity	wt%	99.5 Min.
Color (APHA)	-	20 Max.
Water	ppm	500 Max.
Inhibitor (MEHQ)	ppm	200±20

*MEHQ : hydroquinone monomethyl ether

*Inhibitor content can be changed by request

Properties

Properties	Unit	Value
Molecular weight	g/mol	86.09
Chemical formula	-	$\text{CH}_2=\text{C}(\text{CH}_3)\text{COOH}$
Specific gravity at 20°C	g/cm ³	1.014
Boiling point	°C	161
Freezing point	°C	15
Heat of polymerization	kcal/kg	184
Solubility (water)	g/100g	Totally miscible above 16°C
Flash point (closed cup)	°C	67
Flash point (open cup)	°C	77
Auto-ignition point	°C	435
Limits of flammability	vol %	1.6~8.7
Viscosity	cP	1.25 at 25°C

*The listed values should be used for reference purpose only.

Applications



Paint



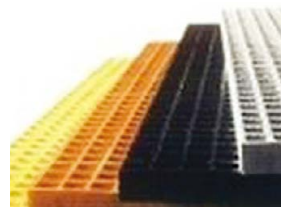
Superplasticizer
for concrete / cement



Fiber materials
(fiber sizing agent)



Adhesives



UP resin
(Unsaturated polyester)



NBR latex

Applications

- Textile processing : Sizing
- Leather technology : Binding, Tanning agent
- Ion-exchange resins : Water treatment
- Cosmetics : Thickening agent, Suspending agent
- Oil-well drilling : Drilling-mud additive, Anti-caking agent
- Paper industry : Filler-retention aid
- Industrial-waste treatments : Suspending agent, Flocculating agent
- Transportation : Skid-proof tires
- Rubber industry : Creaming of latex
- Agriculture : Solid conditioners
- Others : Coating, Adhesive

Advantage

- Hardness
- Flexibility
- Clarity
- Color compatibility
- Toughness
- Weatherability
- Internal plasticization

Handling & Use



Storage

- Store the product at 18~40°C (recommended temperature: 20~25°C)
- It is possible to store up to one year if keeping the recommended temperature and the conditions for storing.
- Should store the product in 5~21% dissolved oxygen, and supply the dissolved oxygen additionally if the storing period becomes long (open the drum cork during the certain time)
- Do first-in, first-out.
- Do not expose to the direct sunlight (drum is using the sunblock material)



Thawing of Frozen MAA

- If product freezes (freezing point: 15°C), it can cause to generate polymer.
- Thaw of the product has to be in thermostat storage less than 35°C or gradually warmed up in a double boiler of the water.
- On thaw, shake the drum twice a day for equal distribution of oxygen and inhibitor.
- Do not apply electric heating bands or steam to thaw containers because it is the main cause of generating polymer.
- Refrain the charging inert gas (nitrogen) within the container.



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