SPECIALTY METHACRYLATES

VIOMER®
From joint product development and specialized technical support to vendor-managed inventory and warehousing, we develop solutions by means of strategic partnerships and provide know-how for start-to-finish solutions. VISIOMER®, Evonik’s global trademark for methacrylate monomers, stands for high-quality products, global service and outstanding expertise.

Today, our portfolio includes more than 40 specialty methacrylates, offering a versatile toolbox to solve literally any challenge in a broad range of application areas. Since we are at the forefront of innovation, Evonik’s methacrylate labs have developed more than 400 different monomers over the years. We go beyond the boundaries. Our technical and production capabilities ready us to support our customers to develop solutions for their specific problems, and we personally invite them to add new pages to the book of outstanding collaborations.
Creating possibilities for a sustainable world.

Our Specialty Methacrylates serve a broad range of industries and applications. Our ToolBox is filled with solutions to your challenges. We carry the tools that will allow you to develop unique, sustainable products.

As your preferred partner, we have the capability and creativity allowing you to expand the boundaries of your business by assisting you to develop innovative products and find solutions to your customer demands.

Looking to the future, we are ready to go beyond existing technologies and contribute new solutions that help preserve the limited resources of our planet.

**The building blocks for your solutions are in our ToolBox.**
Methacrylates are versatile building blocks for...

**EMULSION POLYMERIZATION**
The basis of this polymerization method is the formation of a large amount of dispersed “micoreactors” of polymerizable monomer in a continuous phase of water. The components for this reaction are:

- one or several radically polymerizable monomers
- a surfactant capable of emulsifying hydrophobic monomers in water
- a water-soluble initiator that can be activated by thermal decomposition or a redox reaction to start the radical polymerization.

**SUSPENSION (BEAD) POLYMERIZATION**
This technique involves mechanically dispersing monomer in a non-compatible liquid, usually water, and polymerizing the resultant monomer droplets by use of a monomer-soluble initiator. If the process is carefully controlled, polymer is obtained in the form of granular beads, which are easy to handle and can be isolated by filtration or by spray drying. A major advantage is that heat transfer is very efficient and the reaction is therefore easily controlled.

**SOLUTION POLYMERIZATION**
This polymerization type uses a solvent. Both the resulting resin and the monomers have to be soluble in the solvent used. Peroxides or azo compounds serve as radical initiators. The degree of polymerization and thus the molecular weight of the resulting resin molecules can be adjusted via the initiator and monomer concentrations, the polymerization temperature, chain transfer agents, or even the type of solvents used.

**REACTIVE DILUENTS**
Reactive systems typically consist of monomer and polymer mixtures that react with each other upon triggering the polymerization by e.g. presence of metal ions, radiation or other means. Initially the monomer acts as solvent/diluent to decrease the overall viscosity of the formulation. After application, the reactive diluent is polymerized to achieve the final properties and to reduce the VOC in contrast to formulations with conventional organic solvents. Reactive diluents are for example used in low VOC lacquers, composite resins or in anaerobic adhesives. The latter are used for bonding and sealing metal.

**VISIOMER® methacrylates**

**COATINGS**

**VISIOMER® methacrylates** provide coatings with outstanding performance and make your resin partially biorenewable.

**Selected Solutions**

**VISIOMER® Terra IBOMA & c-HMA** provide weather- and scratch resistance to solvent borne coatings and allow for reduction of solvent content without compromising leveling and gloss. Resins with IBOMA or CHMA show fast physical drying. VISIOMER® Terra-IBOMA contributes to the biorenewable character of your paints.

**Benefits**
- Excellent weather- and scratch resistance
- SB coatings with low VOC, fast physical drying and outstanding leveling and gloss
- Carbon footprint reduction

**VISIOMER®** methacrylates take shear stability, usability and performance of emulsion paints to a higher level.

**Selected Solutions**

**VISIOMER® MPEG MA’s** provide water borne paints with excellent low temperature stability against agglomeration.

**VISIOMER® MEEU** improves paint adhesion and wet scrub resistance.

**VISIOMER® C18 PEG 1105 MA W** promotes associative thickening for better sag control.

**VISIOMER® Long Alkyl Chain Esters** enhance hydrophobicity of emulsion paints and strengthen resin resistance against polar media.

**Benefits**
- Excellent shear stability, viscosity control and adhesion of emulsion paints to a variety of substrates
- Higher resistance against polar chemicals
Acrylic materials based on methacrylate monomers are proven solutions in the construction industry. In applications like industrial flooring, reactive road markings, liquid water proofing systems, concrete admixtures and chemical anchoring, methacrylates are easy to process and cure rapidly even at low temperatures.

**Selected Solutions**

VISIOMER® MPEG MAs and VISIOMER® DMAPMA with hydrophilic crosslinkers like VISIOMER® PEG 200DMA are well established as injection gels. VISIOMER® MPEG MAs are important building blocks for the synthesis of super plasticizers for concrete admixture systems. Benefits:

- Fast curing, even at low temperatures
- Low-odor, reactive diluent
- Chemical stability

**Selected Solutions**

Formulations of water soluble VISIOMER® MPEG MAs and VISIOMER® DMAPMA with hydrophilic crosslinkers like VISIOMER® PEG 200DMA are well established as injection gels.

**Selected Solutions**

VISIOMER® Terra IBOMA, BNMA, THFMA and EHMA are used in combination with VISIOMER® crosslinkers for the formulation of structural adhesives. VISIOMER® MEEU is used to improve adhesion and cohesion of emulsion polymers for PSA's. Benefits:

- Improved cohesive strength and resistance
- Formulation components with low hazard potential
- Increased adhesion to polar surfaces

**Selected Solutions**

VISIOMER® GLYFOMA is a new partially bio-based reactive diluent with an exceptionally low level of vapor pressure for composite resins. VISIOMER® 1,4-BDDMA and TMPTMA are used as reactive diluents to improve mechanical properties. Benefits:

- Low-odor, reactive diluents
- Improved mechanical properties

**Selected Solutions**

VISIOMER® long alkyl chain methacrylates like VISIOMER® Terra C13-MA, Terra C17.4-MA and C18-22-MA are essential constituents of wax inhibitors for flow assurance. Cationic methacrylates and methacrylamides such as VISIOMER® MAPTAC and TMAEMC are used in water treatment, in both production and stimulation. They act as comonomers in friction reducer polymers for hydraulic fracturing. VISIOMER® N-IPMAA is used as building block for polymers in oil & gas applications. Benefits:

- Improved flow assurance
- Treatment of high brine waters
Methacrylates are versatile monomers used in many different application areas. Due to their properties ranging from very hydrophilic to hydrophobic, and imparting Tg’s from −70 °C up to 150 °C, VISIOMER® specialty methacrylates offer the opportunity to tune resin properties and to impart special functionality.

Plastics & Rubber
VISIOMER® 1,4 BDDMA, VISIOMER® EGDMA and VISIOMER® TMPTMA are co-agents for rubber cross-linking, can replace volatile plasticizers in plastisols or improve mechanical properties of plastic films and artificial marble resins.

Paper & Water & Textile
VISIOMER® MADAME, VISIOMER® DMAPMA and VISIOMER® NIPMAA are amino functional monomers used as comonomers together with VISIOMER® TMAEMC and VISIOMER® MAPTAC, two cationic methacrylates for paper sizing, retention agents, dewatering agents, and flocculants.

Surfactants & Thickeners
VISIOMER® MPEG MAs are used as polymerizable surfactants in emulsion polymerization or as comonomers of polymeric surfactants.

VISIOMER® C18 PEG 1105 MA is a specialty methacrylate for the synthesis of associative thickeners.

Personal Care & Health Care
VISIOMER® UHP-HEMA is a high-purity grade of hydroxy ethyl methacrylate developed for the production of soft contact lenses.

VISIOMER® HEMATMDI, VISIOMER® TRGDMA and VISIOMER® PEG200DMA are used in dental compounds and adhesives for dental applications.

VISIOMER® MADAME, VISIOMER® NIPMAA and VISIOMER® TMAEMC improve the performance of personal care products.

Benefits
- Tunable resin properties by functional comonomers
- Crosslinkers for improved mechanical and chemical resistance
- Provides special functionalities like amino groups, cationic moieties and hydrophilic side chains

These VISIOMER® products are all made from raw materials with bio-carbon content.

<table>
<thead>
<tr>
<th>Product</th>
<th>Bio-carbon content*</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISIOMER® IBOA</td>
<td>77%</td>
</tr>
<tr>
<td>VISIOMER® THFMA</td>
<td>56%</td>
</tr>
<tr>
<td>VISIOMER® GLYFOMA</td>
<td>38%</td>
</tr>
<tr>
<td>VISIOMER® Terra IBOMA</td>
<td>71%</td>
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<tr>
<td>VISIOMER® Terra C13-MA</td>
<td>76%</td>
</tr>
<tr>
<td>VISIOMER® Terra C17.4-MA</td>
<td>81%</td>
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*Calculated as ratio of C-number alcohol to C-number methacrylate

VISIOMER® Terra products are eco-friendly labelled and contribute to sustainable solutions with high Bio-Carbon content.

SELECTED SOLUTIONS FOR SPECIAL APPLICATIONS

<table>
<thead>
<tr>
<th>ALKYL/ARYL (METH)ACRYLATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISIOMER®</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>EHMA</td>
</tr>
<tr>
<td>IDMA</td>
</tr>
<tr>
<td>Terra C13-MA</td>
</tr>
<tr>
<td>Terra C17.4-MA</td>
</tr>
<tr>
<td>C18-22-MA</td>
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<td></td>
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<td>C18-22-MA</td>
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<td>IBOA</td>
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<tr>
<td>Terra IBOMA</td>
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<td>BNMA</td>
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VISIOMER® product range
**CROSSLINKERS**

<table>
<thead>
<tr>
<th>VISIOMER®</th>
<th>Chemical Name</th>
<th>Formula</th>
<th>Main applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMA</td>
<td>Allyl methacrylate CAS No. 96-05-9</td>
<td><img src="" alt="Formula" /></td>
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<tr>
<td>EGDMA</td>
<td>Ethylene glycol dimethacrylate CAS No. 97-90-5</td>
<td><img src="" alt="Formula" /></td>
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<tr>
<td>TRGDMA</td>
<td>Triethylene glycol dimethacrylate CAS No. 109-16-0</td>
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<tr>
<td>PEG200DMA</td>
<td>Polyethylene glycol 200 dimethacrylate CAS No. 25832-47-5</td>
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<td>1,3-BDDMA</td>
<td>1,3-Butanediol dimethacrylate CAS No. 1189-08-8</td>
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<td>1,4-BDDMA</td>
<td>1,4-Butanediol dimethacrylate CAS No. 2082-81-7</td>
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<td>1,6-HDDMA</td>
<td>1,6-Hexanediol dimethacrylate CAS No. 6606-59-3</td>
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<td>GDMA</td>
<td>Glycerol dimethacrylate CAS No. 1850-78-0</td>
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<td>TMPTMA</td>
<td>Trimethylolpropane trimethacrylate CAS No. 3290-53-4</td>
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<tr>
<td>HEMATMDI</td>
<td>Diurethane dimethacrylate CAS No. 72869-86-4</td>
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**ETHER/ACETAL METHACRYLATES**

<table>
<thead>
<tr>
<th>VISIOMER®</th>
<th>Chemical Name</th>
<th>Formula</th>
<th>Glass Transition Temperature Tg</th>
<th>Main applications</th>
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<tbody>
<tr>
<td>ETMA</td>
<td>Ethyl triglycol methacrylate CAS No. 39170-09-2</td>
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<tr>
<td>THFMA</td>
<td>Tetrahydrofurfuryl methacrylate CAS No. 2453-24-5</td>
<td><img src="" alt="Formula" /></td>
<td>40 °C</td>
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<tr>
<td>BDGMA</td>
<td>Butyl diglycol methacrylate CAS No. 7328-22-5</td>
<td><img src="" alt="Formula" /></td>
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<tr>
<td>C18 PEG 1105 MA W</td>
<td>Methacrylate ester (25 EO) C16-C18 fatty alcohol (in water/GMAA) CAS No. 70879-51-5</td>
<td><img src="" alt="Formula" /></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>MPEG 750 MA W</td>
<td>Methoxy polyethylene glycol 750 methacrylate (50% in water) CAS No. 26915-72-0</td>
<td><img src="" alt="Formula" /></td>
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</tr>
<tr>
<td>MPEG 1005 MA W</td>
<td>Methoxy polyethylene glycol 1000 methacrylate (50% in water) CAS No. 26915-72-0</td>
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<tr>
<td>MPEG 2005 MA W</td>
<td>Methoxy polyethylene glycol 2000 methacrylate (50% in water) CAS No. 26915-72-0</td>
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<tr>
<td>MPEG 5005 MA W</td>
<td>Methoxy polyethylene glycol 5000 methacrylate (50% in water) CAS No. 26915-72-0</td>
<td><img src="" alt="Formula" /></td>
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<tr>
<td>GLYFOMA</td>
<td>Glycerol formal methacrylate CAS No. 1620329-57-8</td>
<td><img src="" alt="Formula" /></td>
<td>80–95 °C</td>
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</tr>
</tbody>
</table>

**Application Areas:**

- Coatings
- Adhesives
- Composites
- Construction
- Plastics
- Textile & Leather
- Oil & Gas
- Paper & Water
- Personal Care & Health Care
- Synthesis

For further information visit our VISIOMER® ToolBox.
SPECIALTY METHACRYLAMIDES

**VISIOMER®** | Chemical Name | Formula | Main applications
--- | --- | --- | ---
N-MMAA | N-Methyl methacrylamide (aqueous solution) | CAS No. 923-02-4 | ![Icon for adhesives]
N-IPMAA | N-Isopropyl methacrylamide CAS No. 13749-61-6 | ![Icon for adhesives]

AMEO METHACRYLATES

**VISIOMER®** | Chemical Name | Formula | Glass transition Temperature $T_g$ | Main applications
--- | --- | --- | --- | ---
UHP-HEMA | Ultra high purity 2-Hydroxyethyl Methacrylate CAS No. 868-77-9 | ![Formula for UHP-HEMA] | 55 °C | ![Icon for coatings and adhesives]

WET ADHESION MONOMERS

**VISIOMER®** | Chemical Name | Formula | Main applications
--- | --- | --- | ---
MEEU 50 W | N-(2-Methacryloyloxyethyl) ethylene urea (50% in Water) CAS No. 86261-90-7 | ![Formula for MEEU 50 W] | ![Icon for adhesives]
MEEU 25 M | N-(2-Methacryloyloxyethyl) ethylene urea (25% in methyl methacrylate) CAS No. 86261-90-7 | ![Formula for MEEU 25 M] | ![Icon for adhesives]

SPECIALTY INTERMEDIATES

**VISIOMER®** | Chemical Name | Formula | Main applications
--- | --- | --- | ---
MAAH | Methacrylic anhydride CAS No. 760-93-0 | ![Formula for MAAH] | ![Icon for adhesives]
ECH | Ethylene cyanohydrin CAS No. 109-78-4 | ![Formula for ECH] | ![Icon for adhesives]

**Application Areas:**
- Coatings
- Adhesives
- Composites
- Construction
- Plastics
- Textile & Leather
- Oil & Gas
- Paper & Water
- Personal Care & Health Care
- Synthesis

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