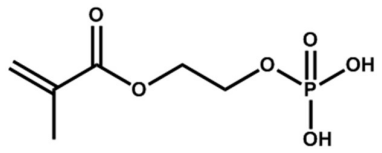
VISIOMER® HEMA-P – Adhesion promoter, anti-corrosion & flame-retardant agent for Coatings & Adhesives.

VISIOMER® HEMA-P: AN OVERVIEW

2-Hydroxyethyl-Methacrylate-Phosphate (HEMA-P) is a well-known adhesion promoter in applications like adhesives or coating resins. Evonik Operations GmbH offers **VISIOMER® HEMA-P 70M** and **VISIOMER® HEMA-P 100**. A comparison of the two products can be found in Table 1.

FIGURE 1: Structure of the active ingredient in **VISIOMER® HEMA-P**.



Recent studies on the performance of our **VISIOMER® HEMA-P** products in acrylic resins revealed the following additional benefits:

- an improved corrosion protection
- flame-retardant properties.

Its versatile capabilities are described in detail below.

Table 1: Comparison of **VISIOMER® HEMA-P 70M** and **VISIOMER® HEMA-P 100**.

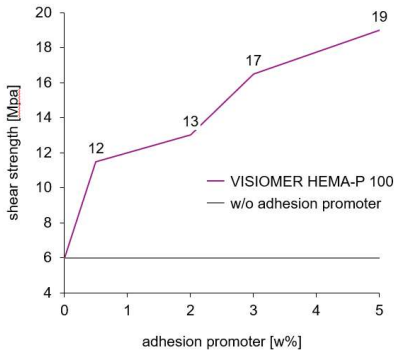
	VISIOMER® HEMA-P 70M	VISIOMER® HEMA-P 100
Supply	in 30% MMA	pure
Viscosity	40 – 75 mPa*s	3000 – 7000 mPa*s
P-content	10.6%	15%
Application Areas	▪ Emulsion Polymerization ▪ Bulk Polymerization ▪ Reactive Resins	▪ All application areas where MMA is critical due to VOC, odor, flammability or performance

ADHESION PROMOTION

VISIOMER® HEMA-P products can be used as functional co-monomers for adhesives and coatings. They enable superior adhesion to polar surfaces like minerals, glass, and metals.

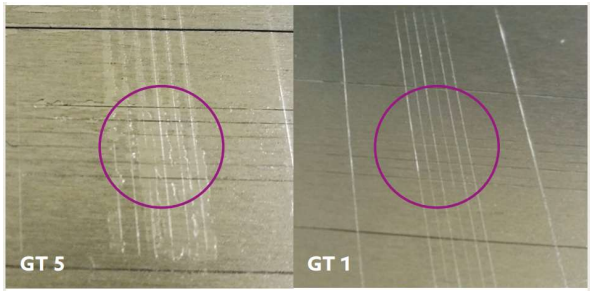
Figure 2 shows that even small concentrations of **VISIOMER® HEMA-P** increase the shear strength of a standard 2K methacrylate-based structural adhesive on steel substrates substantially. It easily triples the shear strength at an addition of 5 wt% of **VISIOMER® HEMA-P 100**.

FIGURE 2: Performance of adhesion promoters in a standard structural adhesive formulation.



In emulsion coatings, **VISIOMER® HEMA-P 70M** also provides superior adhesion. The addition of the adhesion promoter boosts the adhesion of emulsion-based films on metal substrates from GT5 to GT1, as shown in Figure 3.

FIGURE 3: Cross-cut test for emulsion coatings on metal substrates with 7 wt% and without VISIOMER® HEMA-P 70M.



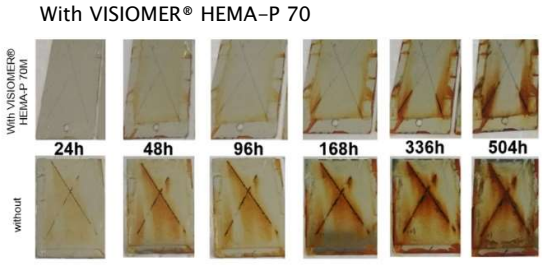
Without adhesion promoter — With VISIOMER® HEMA-P 70M

In a nutshell, **VISIOMER® HEMA-P** is a specialty methacrylate, which improves adhesion dramatically even at low concentrations. It merges high polarity with adequate flexibility, making it an added value for developers.

CORROSION PROTECTION

Corrosion protection has always been an important requirement for coatings. The trend towards water-borne systems makes anti-corrosion properties a challenge.

FIGURE 4: Salt-spray test on galvanized steel substrate for emulsion coating with 7 wt% and without **VISIOMER® HEMA-P 70M.**



Without anti-corrosion agent

Our studies on acrylic emulsions with 7 wt% of **VISIOMER® HEMA-P 70M** demonstrate enhanced corrosion resistance compared to resins without any anti-corrosion agent (Figure 4). Panels coated with **VISIOMER® HEMA-P 70M** containing emulsion polymers withstood corrosion up to 168 hours in a saltwater immersion test.

FLAME RETARDENT PROPERTIES

New regulations drive industry interest towards alternatives for conventional halogen-based flame-retardants, alternatives that are non-migrating and less hazardous.

VISIOMER® HEMA-P is a polymerizable flame retardant comprising a smart combination of a phosphoric acid and methacrylate moiety, and the phosphate function is responsible for the flame-retardant properties of the product. The methacrylate group readily polymerizes and leads to a non-migrating agent. Depending on flame retardant performance targets, the **VISIOMER® HEMA-P** products can replace flame- retardant additives partly or completely.

A single-flame source test was conducted on acrylic polymer emulsions containing 14 wt% **VISIOMER® HEMA-P 70M** (Figure 5). It confirms the flame-retardant properties of **VISIOMER® HEMA-P 70M** containing emulsions.

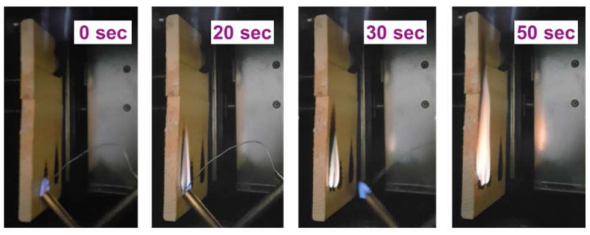
In conclusion, **VISIOMER® HEMA-P** is a specialty methacrylate monomer offering versatile solutions for different industries like adhesives, coatings, composites and construction.

VISIOMER® METHACRYLATES – READY FOR THE NEXT LEVEL

Evonik Methacrylates looks forward to supporting you in finding the best solution for your next challenge in polymer design. Contact us for further information on our **VISIOMER® HEMA-P** products.

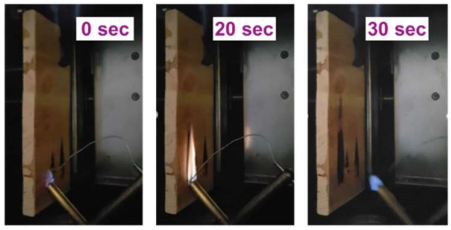
FIGURE 5: Single-flame Source Test according to ISO 11925-2:2010 on emulsion-coatings with 14 wt% and without **VISIOMER® HEMA-P 70M.**

Without flame-retardant



Ignition | After 20 sec | After 30 sec - Burner is removed | After 50 sec – Sample still burns

With VISIOMER® HEMA-P 70M



Ignition | After 20 sec | After 30 sec - Burner is removed. Sample stops burning

OUR PROMISE TO YOU

- We are your methacrylate experts for specialty monomers.
- We are at your service with a globally available sales and technology organization.
- We are your solution provider with tailor-made products and joint research & development projects.
- We support your growth through a reliable and flexible global production & technology network.
- We are looking for a long-term partnership and mutual value creation.

Evonik Operations GmbH
Business Line Oil Additives
Specialty Methacrylates
Kirschenallee
64293 Darmstadt
Germany

Phone +49 6151 18-4671
visiomer@evonik.com
www.visiomer.com
www.evonik.com

Evonik Specialty Chemicals (Shanghai) Co., Ltd
Business Line Oil Additives
55 Chundong Road,
Xinzhuang Industry Park,
Shanghai 201108, China

Evonik Oil Additives USA, INC.
723 Electronic Drive
Horsham, PA 19044-4050
USA