

## Information Sheet

Cardura E10P Glycidyl Ester

### High Performance Hydroxyl Functional Acrylic Emulsions Made Easy



#### Hydroxyl Functional Emulsions

#### High-performance waterborne industrial coatings

The demand for waterborne industrial coatings is rapidly increasing. Waterborne epoxy, acrylic polyol (APO) dispersions and hydroxyl (OH) -functional emulsions are gaining market share in high-performance industrial coatings applications with a lower environmental footprint. Compared to APO dispersions, OH-functional acrylic emulsions offer a low cost and easy route towards faster drying speed and hardness development. OH-functional acrylic emulsions can be designed with a wide range of hydroxyl values and performance parameters to address the needs of many different applications in plastic, wood, automotive and construction coatings.

#### Emulsion Polymerization of Hydroxyl Acrylates

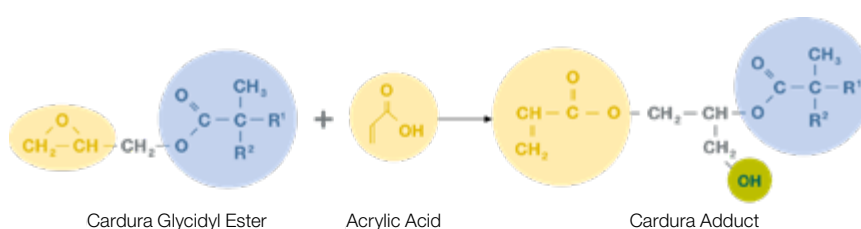
#### An hydrophobic building block for high-performance hydroxyl functional emulsions

In emulsion polymerization generally monomers with a relatively low water solubility are used. The use of highly water soluble hydroxyl acrylates such as 2-hydroxyethyl methacrylate (HEMA) or 2-hydroxyethyl acrylate (HEA) strongly affects the monomer partitioning in the emulsion copolymerization process. This leads to high grit formation, a heterogeneous polymer composition and difficulties reaching a high OH-value and solids content. The resulting polymers suffer from a high water sensitivity and poor solvent compatibility. The hydrophobic Cardura E10P glycidyl ester-based hydroxyl acrylate monomer overcomes these issues and offers a unique solution to produce high performance hydroxyl functional emulsions.

#### Cardura™ E10P Building Block for Hydroxyl Functional Emulsions

#### Adducts of Cardura E10P glycidyl ester & (meth)acrylic acid

Cardura E10P glycidyl ester can be converted into a hydroxyl-functional acrylic monomer by reaction with (meth)acrylic acid. The resulting monomer has a unique structure that combines a bulky hydrophobic tail, a pendant hydroxyl group and an acrylate functionality. In the production of hydroxyl functional emulsions, the acrylic functionality allows this monomer to be polymerized with a wide variety of monomers including styrene, acrylics and vinyls. The pendant hydroxyl group is then available for further crosslinking.



### The Cardura E10P glycidyl ester-based building blocks for OH-emulsions offer:

- Low water solubility & high hydrophobicity
- Easy polymerization process and reduced grit formation
- High performance in terms of water resistance, chemical resistance and appearance
- Increased cross-link density
- Flexibility to formulate over a wide range of OH-values

### Easy Process towards Highly Stable OH Emulsions

#### Easy process with low Grit formation leads to highly stable OH emulsions

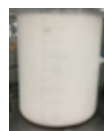
The hydrophobic Cardura E10P glycidyl ester-based hydroxyl acrylate monomer leads to very stable monomer pre-emulsions. Combined with a more favorable monomer partitioning and reaction kinetics during the polymerization process this enables the production of hydroxyl functional emulsions with very low grit content and increased OH-value.

The easy process and low process grit bring benefits in terms of high yield rates, reduced waste handling and less fouling of reactors.

#### Pre-Monomer Emulsion

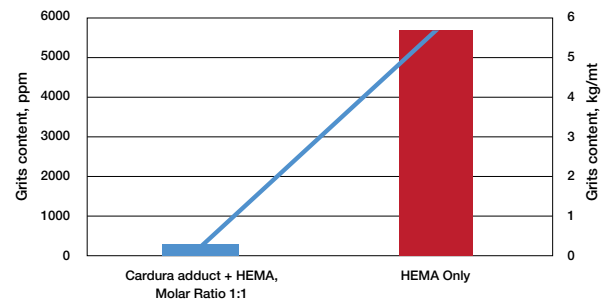


HEMA as the sole OH monomer  
← Unstable



Cardura Adduct + HEMA as the OH monomers  
← Stable

#### Process Grits (based on solids)



Comparison of grit formation of two OH-emulsions with an OH-content of 4.2%.

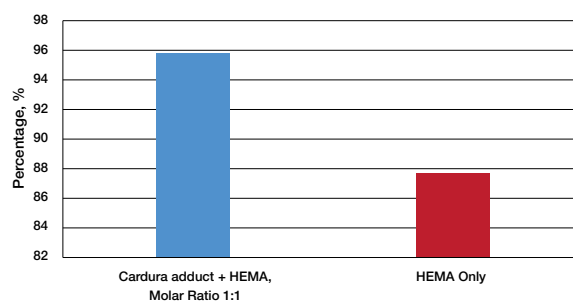
### Increased Performance at Lower Costs

#### Higher effective cross-link density leads to increased performance and lower costs

At low to medium hydroxyl value, the OH-functional emulsion based on Cardura E10P monomer adducts has a much higher crosslinking density compared to OH-functional emulsions based on HEMA. This is due to the more hydrophobic nature of the Cardura E10P adduct, which ensures a homogeneous distribution of OH groups in the emulsion particles.

A higher effective crosslink density at lower OH-content is a cost-effective approach to achieve high chemical resistance and drying speed. This provides cost saving opportunities since less isocyanate curing agents are needed compared to emulsions with a higher OH-content.

#### Crosslinking Density



Comparison of cross-link density of two OH-emulsions with an OH-content of 2%.

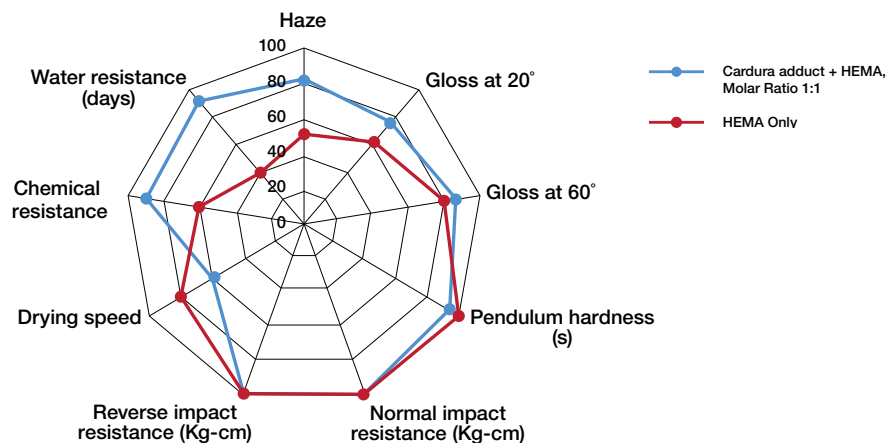
## Delivering Performance

### High performance in a wide range of different hydroxyl-functional acrylic emulsions

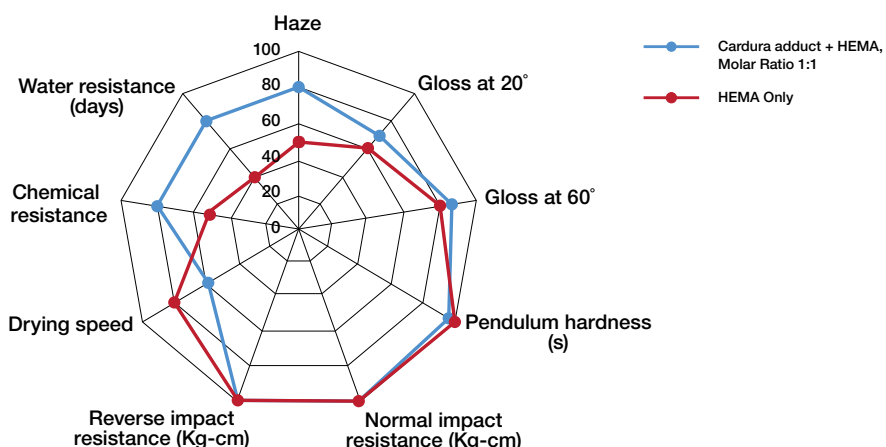
The following graphs show some examples of the performance of coatings formulated with emulsions based on a 1:1 molar ratio of Cardura E10P glycidyl ester-based hydroxyl acrylate and HEMA, compared to emulsions based on HEMA only.

Coatings are prepared with both a high OH-value emulsion (4% OH-content) and a medium OH-value emulsion (2% OH-content).

#### High OH-value emulsion (4% OH-content)



#### Medium OH-value emulsion (2% OH-content)



The drying speed of Cardura adduct based hydroxyl emulsions can be optimized with Hexion toolbox.

## A Versatile Solution

### Customize a unique solution to your customers' needs

The Cardura E10P glycidyl ester-based hydroxyl acrylate building block allows polymer designers to tailor the hydroxyl-functional emulsions for a specific desired end-use. From resins with a low to medium hydroxyl value for wood and protective coatings, to resins with a very high hydroxyl value for wall, floor and high performance industrial top coats.

Paint formulators use these emulsions to create high-performance protective coating solutions for many applications in:

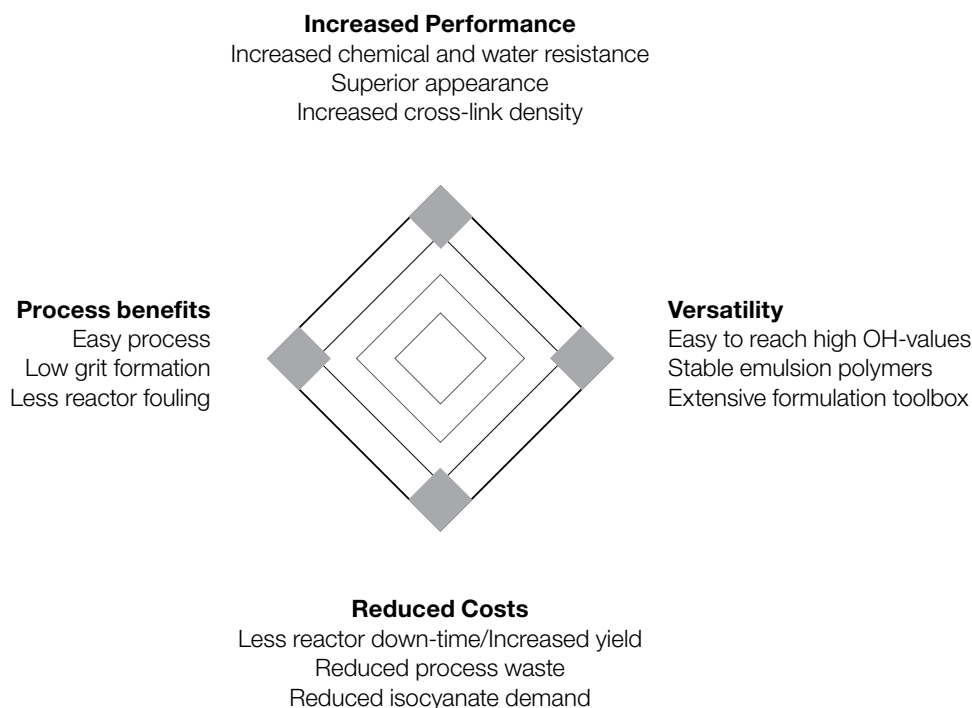
- Protective
- Agricultural, Construction and Earthmoving (ACE)
- Industrial wall and flooring
- Transportation
- Wood

By using Hexion's extensive toolbox and working with our regional technical support teams, you can differentiate from your competitors and deliver exclusive solutions to your market.

## Summary

### High Performance Hydroxyl Functional Acrylic Emulsions Made Easy

Cardura E10P glycidyl ester offers a unique route towards specialty hydroxyl functional (meth)acrylic monomers. This monomer technology combined with an extensive formulation toolbox for hydroxyl-functional emulsions allow you to be in control of the performance that you deliver. Our worldwide technical experts are available to help you design tailor-made solutions to target specific performance characteristics for a wide range of end markets.



Hexion's Versatic™ Acids and Derivatives has a global presence and a strong commitment to the development of customer solutions. We achieve this by operating regional technical laboratories which support customers with starting-point formulations and application guidance.

For more information, please contact your local Hexion sales representative, your distributor or our global customer service network.

#### Reach our Global Customer Service network at:

E-mail: [service@hexion.com](mailto:service@hexion.com) or enter a request on our website [www.hexion.com](http://www.hexion.com) under "contact us"



#### World Headquarters

180 East Broad Street  
Columbus, OH 43215-3799

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