

## Information Sheet

# Cardura™ E10P Glycidyl Ester Ultra-High Solids Hybrid Polyols



### The Need For Ultra-High Solids Resins

### Hexion's Versatics Business Unit is supporting the trend towards low VOC

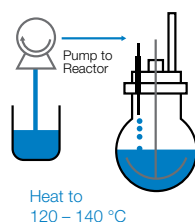
Cardura E10P glycidyl ester is widely used in high-performance solventborne acrylic polyols (APO) for coatings that meet the European 420 g/l VOC automotive refinish requirement. As the world continues to look for further VOC reduction, production of higher solids and particularly ultra-high solids (UHS) resins has become a challenge due to viscosity limitations.

### Hybrid Resin with Star Polyester and Acrylic Polyol

Hexion's Versatics team developed a toolbox that demonstrates how Cardura E10P glycidyl ester enables the production of ultra-high solids hybrid polyols: acrylic polyols polymerized in the presence of a hydroxyl-functional star polyester (Star PE). This simple process (see diagram below) provides flexibility in terms of the selection of solvents, monomers, initiators and reaction temperature selection and enables reaching an optimal balance between key performance parameters like VOC level, drying speed and cost.

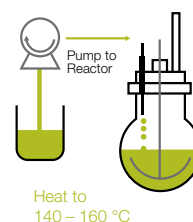
The diagram below shows the simple process to obtain a hybrid resin with star polyester (steps 1 and 2) and acrylic polyol (step 3):

#### Step 1. Starter and anhydride (+solvent) react first



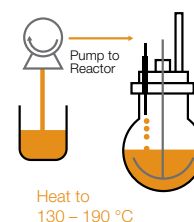
Anhydrides are opened  
on the starter molecule

#### Step 2. Cardura fed in the reactor to obtain Star PE



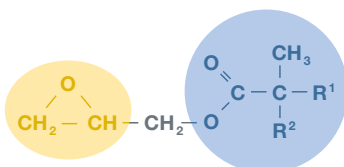
No catalyst or water  
removal needed

#### Step 3. Dosage of monomers and initiator for radical polymerization of APO



APO is polymerized  
on-the-go, both reactions  
are seamlessly processable

### Cardura Glycidyl Ester



### Cardura glycidyl ester quick facts

Cardura E10P glycidyl ester is a versatile building block, with a unique hydrophobic bulky structure and is used in the production of a broad range of high-quality polymers such as acrylic and polyester polyols. The key characteristics of Cardura E10P glycidyl ester are:

- Easily reacts with acids for incorporation in acrylic and polyester polyols
- High boiling point (>250 °C)
- Hydrophobic
- Low surface tension
- Excellent acid resistance
- Superior outdoor durability

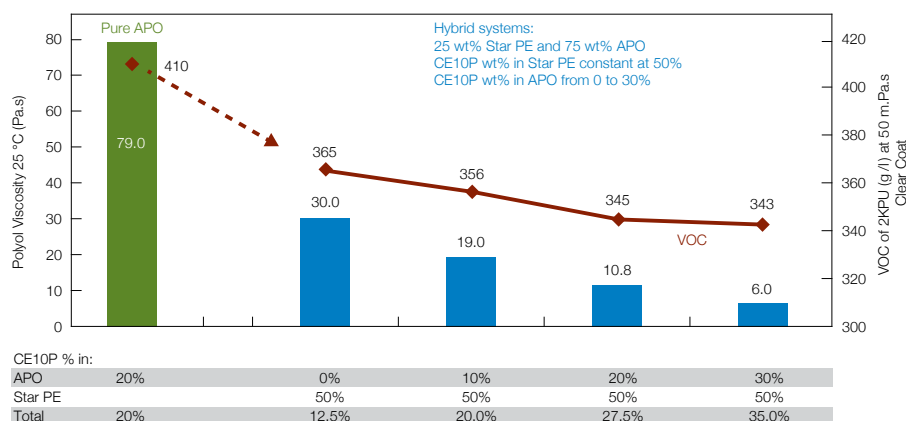
## Further Viscosity Reduction at Moderate Temperatures

## Ultra-high solids polyols by hybridizing acrylic polyol and star polyester chemistries

Cardura E10P glycidyl ester allows acrylic polyol polymerization at higher temperatures that can be used to reduce molecular weight and thus polymer viscosity. In addition to this, the bulky structure of Cardura E10P glycidyl ester limits the intermolecular chain interactions which also contributes to the viscosity reduction.

The chart below shows how the presence of Cardura E10P glycidyl ester in the polymeric chains reduces viscosity and VOC in high performance, high solids 2K PU formulations. For this study, a pure APO and a range of hybrid polyols were synthesized and compared for viscosity and VOC content. The hybrid polyols were produced at 80% solids with 25 wt% Star Polyester (Star PE), containing 50% Cardura E10P glycidyl ester. The acrylic polyol portion of the resins (75 wt%) was prepared at an increasing content of Cardura E10P glycidyl ester, enabling significant decrease of the resin viscosity, and consequently lower VOC in the final PU coating.

**Fig 1. Viscosity Cutting Power of Cardura E10P Glycidyl Ester in 80% Solids Content Hybrid Polyol**



## Summary

Cardura E10P glycidyl ester enables a wider processing window and higher temperature levels, whilst maintaining an appropriate balance of critical application properties such as drying time, pot-life and VOC level which enables formulation cost reduction opportunities.

### Cardura E10P glycidyl ester in hybrid polyol systems brings:

- Solvent reduction, low VOC, HS and UHS resin production
- Easy process, production efficiency
- Wide processing window, moderate polymerization temperatures
- High performance resins, for a wide range of coatings applications

Hexion's Versatics Business Unit 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. This toolbox provides insights on how Cardura E10P glycidyl ester enables ultra-high solids polyols by evaluating the key parameters and their effect on hybridizing acrylic polyol and star polyester chemistries.

### 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"



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