

Ultra LITE Series Epoxy Modifiers

Cardolite Technical Service
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 - Typical Properties
 - Dilution Efficiency
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Ultra LITE Series

- New technology platform that enables Color Gardner 1 or less resin modifiers based on CNSL.
 - Reactive and non-reactive epoxy modifiers
 - Diluents
 - Accelerators
- Additional benefits
 - Hydrophobicity for improved water resistance and corrosion protection
 - Increased flexibility and impact resistance
 - Non-toxic alternative to substances of concern
 - Renewable
 - Cost effective





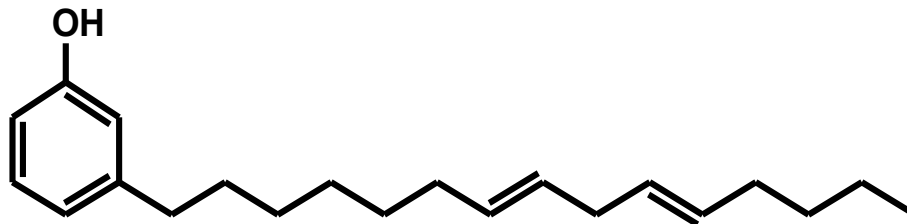
Ultra LITE 2023

Performance and
Properties

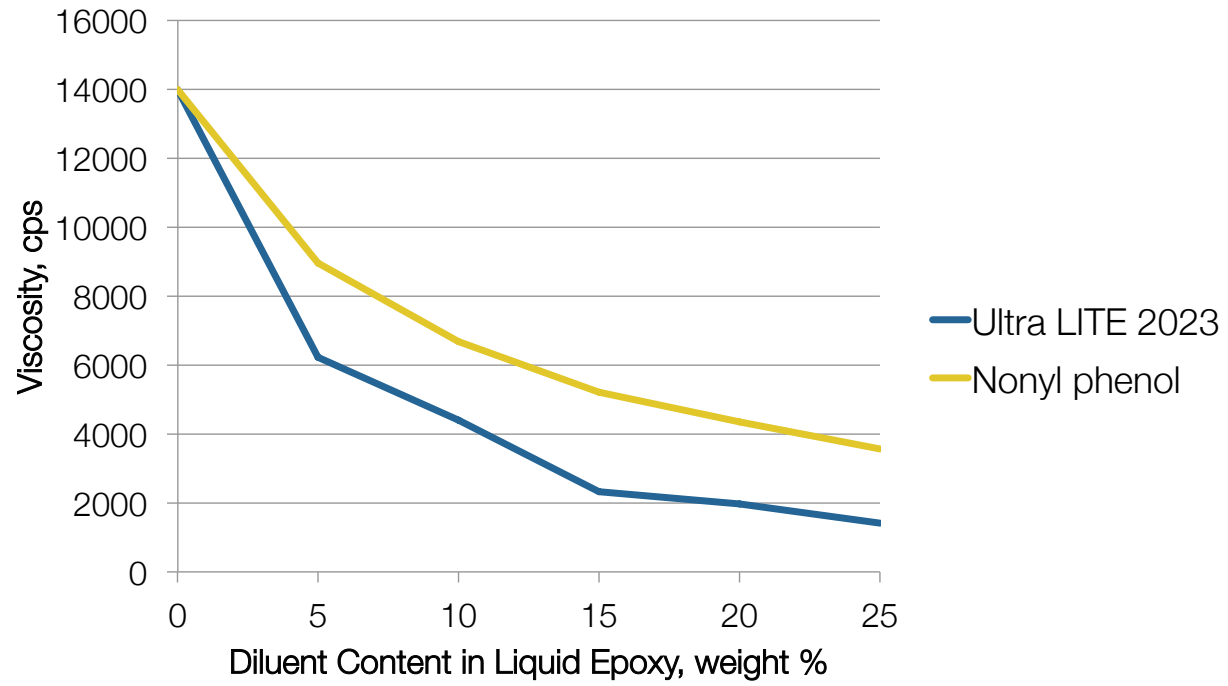
Typical Properties

Property	Typical Values
Description	Non-reactive diluent and accelerator for epoxy coatings
Color (Gardner)	≤ 1
Viscosity @ 25°C (cPs)	40 - 100
Solids (% by weight)	≥ 99.5
Recommended use level (% of total resin)	≤ 20

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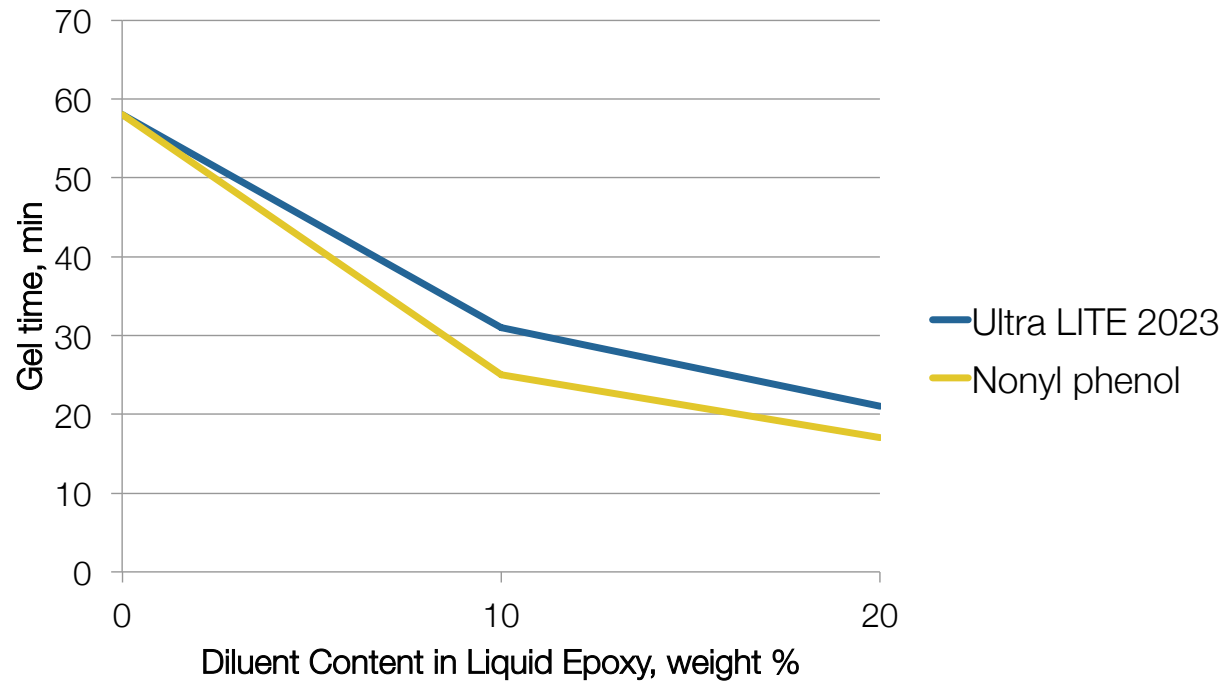
Dilution Power



Ultra LITE 2023 shows much higher dilution power than nonyl phenol.



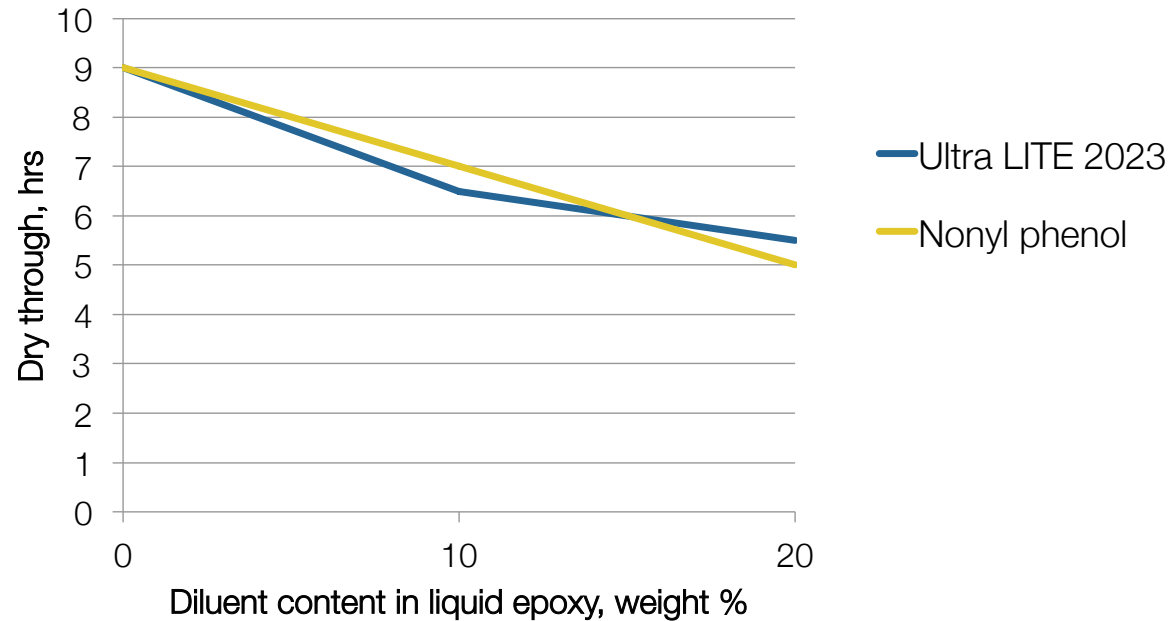
Gel Time



Ultra LITE 2023 does not reduce gel time as much as nonyl phenol.



Acceleration Effect at 25°C

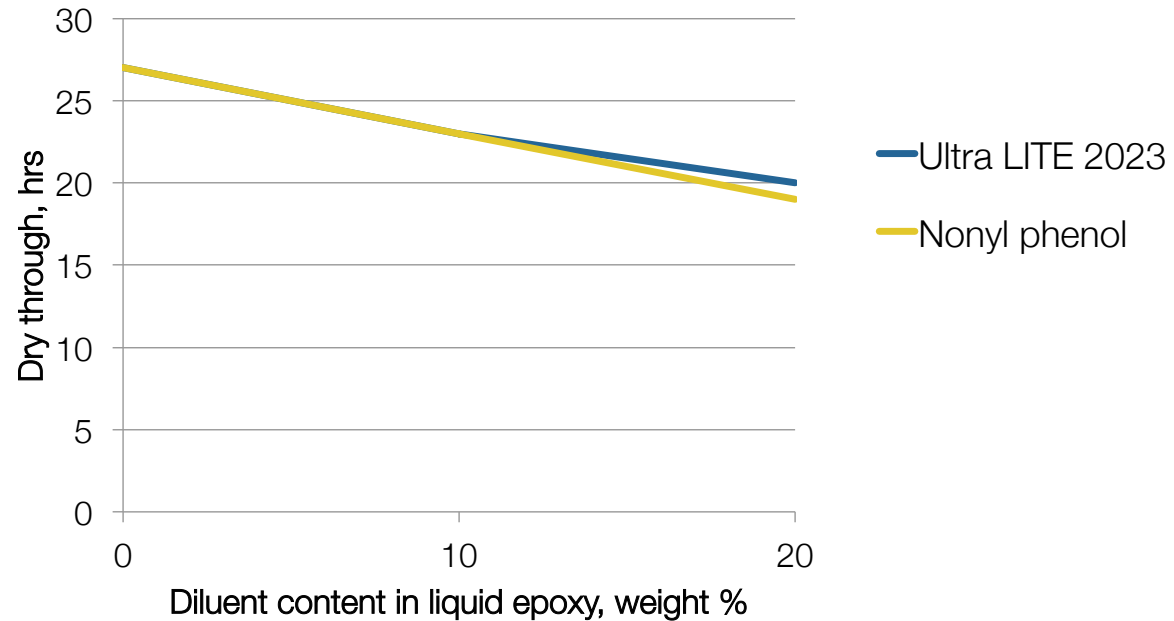


- Ultra LITE 2023 can be used as an accelerator.
- It provides similar acceleration to nonyl phenol at 25°C

**Cured with Cardolite NX-2003



Acceleration Effect at 5°C



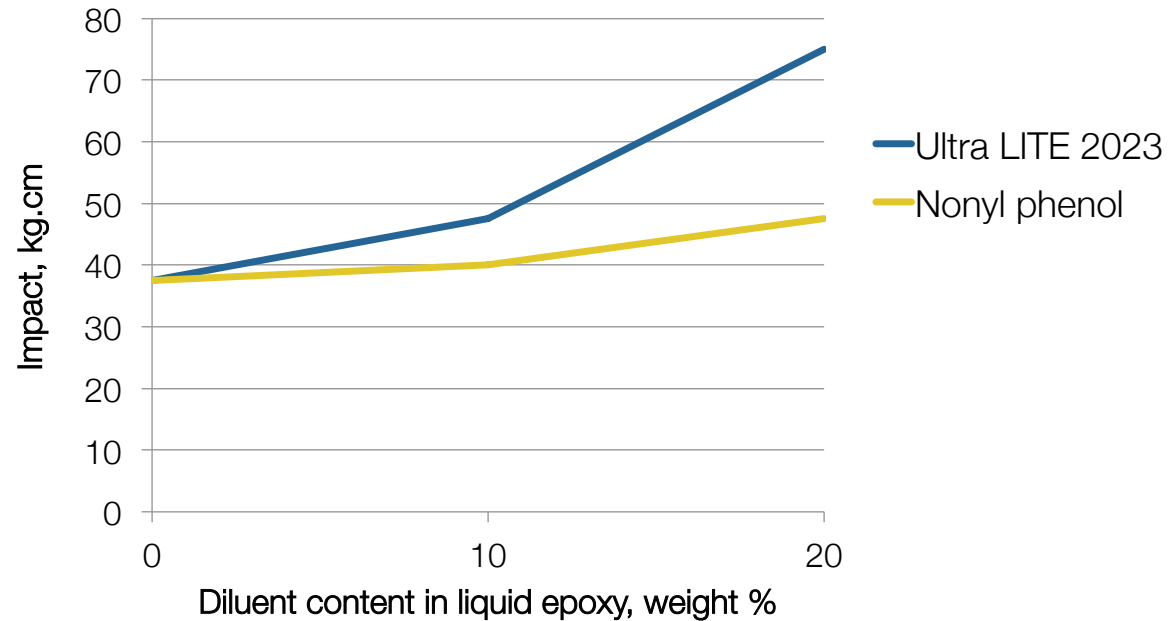
- Ultra LITE 2023 can be used as an accelerator at low temperatures
- It provides similar acceleration to nonyl phenol at 5°C

**Cured with Cardolite NX-2003



Impact Resistance

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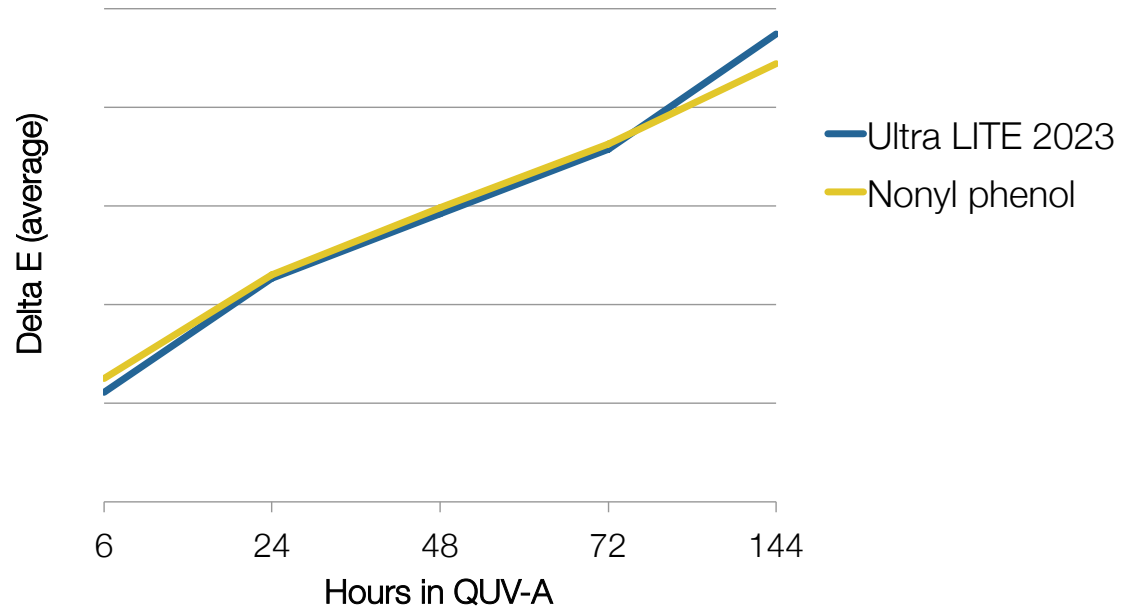
Ultra LITE 2023 increases impact resistance of epoxy systems even at lower levels due to long aliphatic chain.

**Cured with Cardolite NX-2003



Color Retention

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Ultra LITE 2023 shows similar yellowing to nonyl phenol

**Average delta E based on cure with different phenalkamines



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Ultra LITE 513

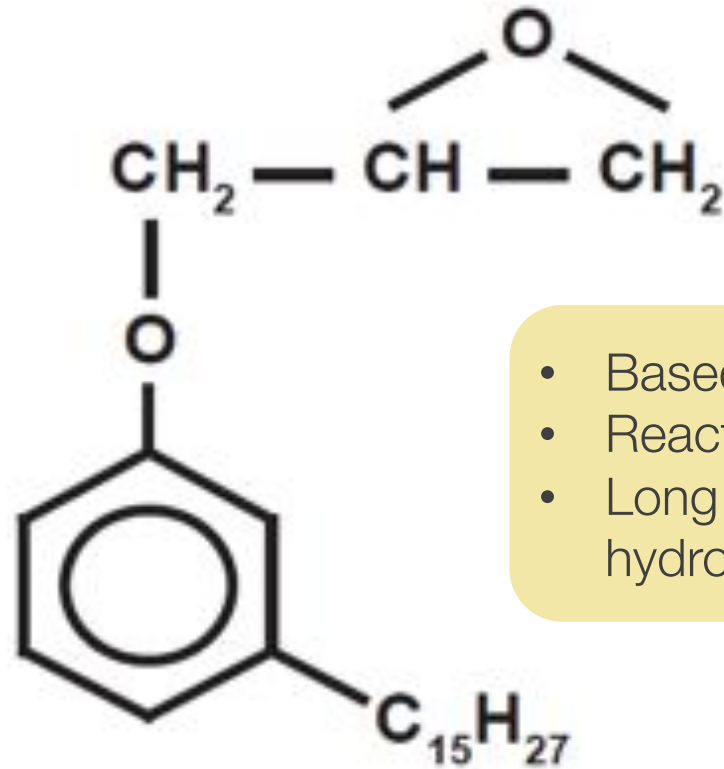
Performance and
Properties

Typical Properties

Property	Typical Values
Description	Reactive modifier for epoxy coatings
Color (Gardner)	≤ 1
Viscosity @ 25°C (cPs)	≤ 45
Epoxy Equivalent Weight (EEW)	≤ 450
Hydrolyzable Chloride Content (%)	≤ 1
Volatile loss (% by weight)	≤ 0.5
Recommended use level (% of total resin)	≤ 20



Product Family Structure



- Based on renewable CNSL
- Reactive
- Long aliphatic chain provides hydrophobicity and flexibility





Ultra LITE 513

Ultra LITE 513

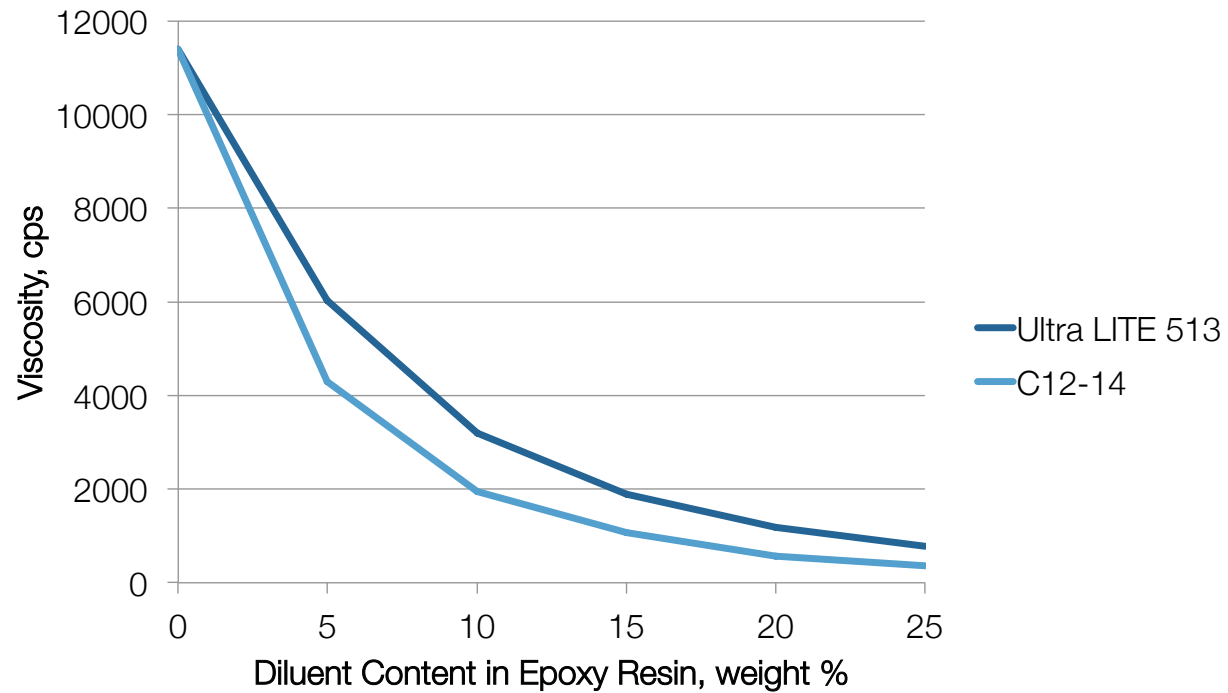
- Very Low Color, Gardner ≤ 1
- Lower EEW
- Lower Viscosity
- Multipurpose Resin Modifier
- Good dilution efficiency
- Imparts flexibility
- Improves water resistance
- Increases chemical resistance
- Comparable yellowing to other reactive diluents



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Dilution Curve

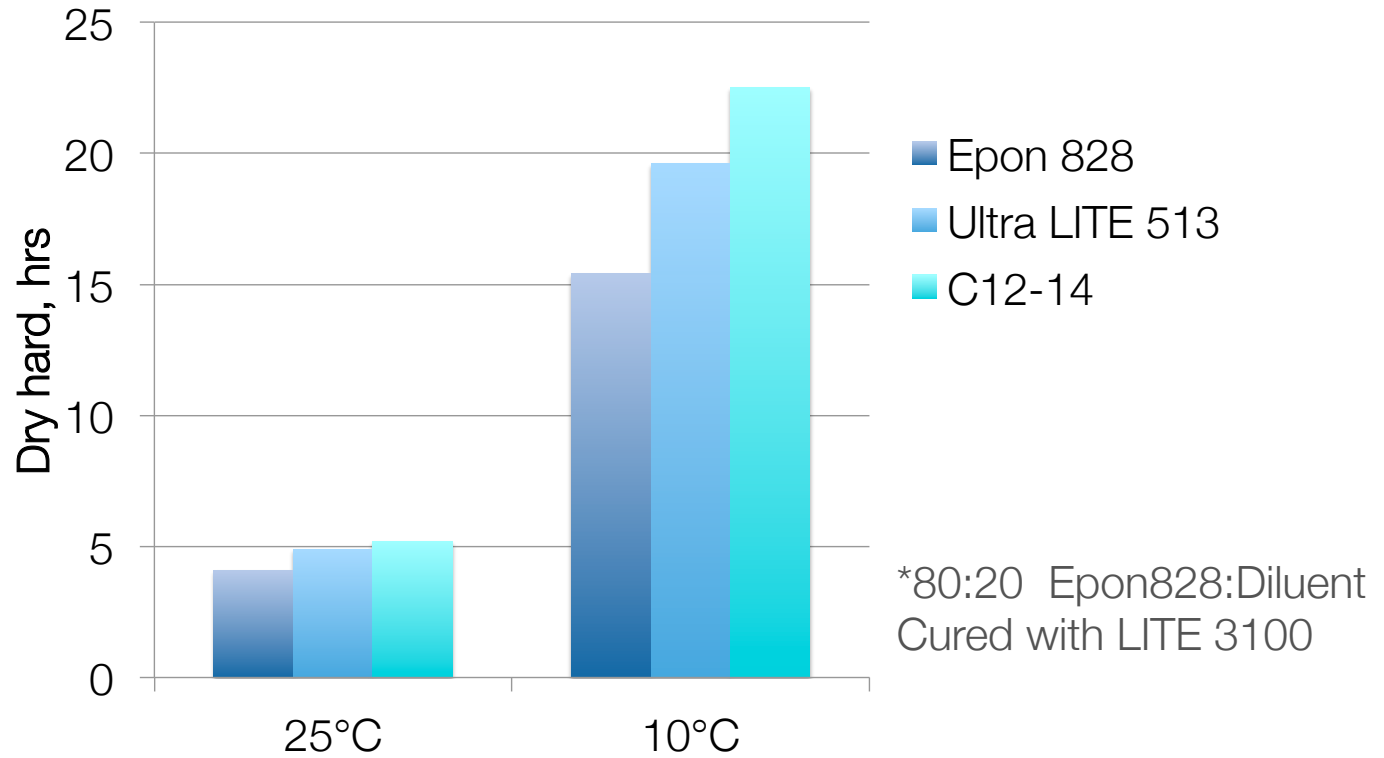


Ultra LITE 513 shows good dilution effect, close to C₁₂-C₁₄ glycidyl ether type diluents at use levels > 10%.



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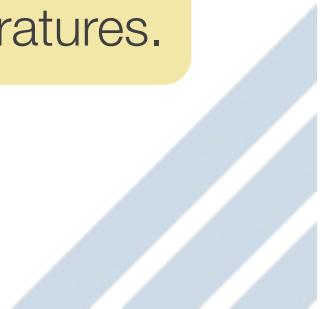
Dry time



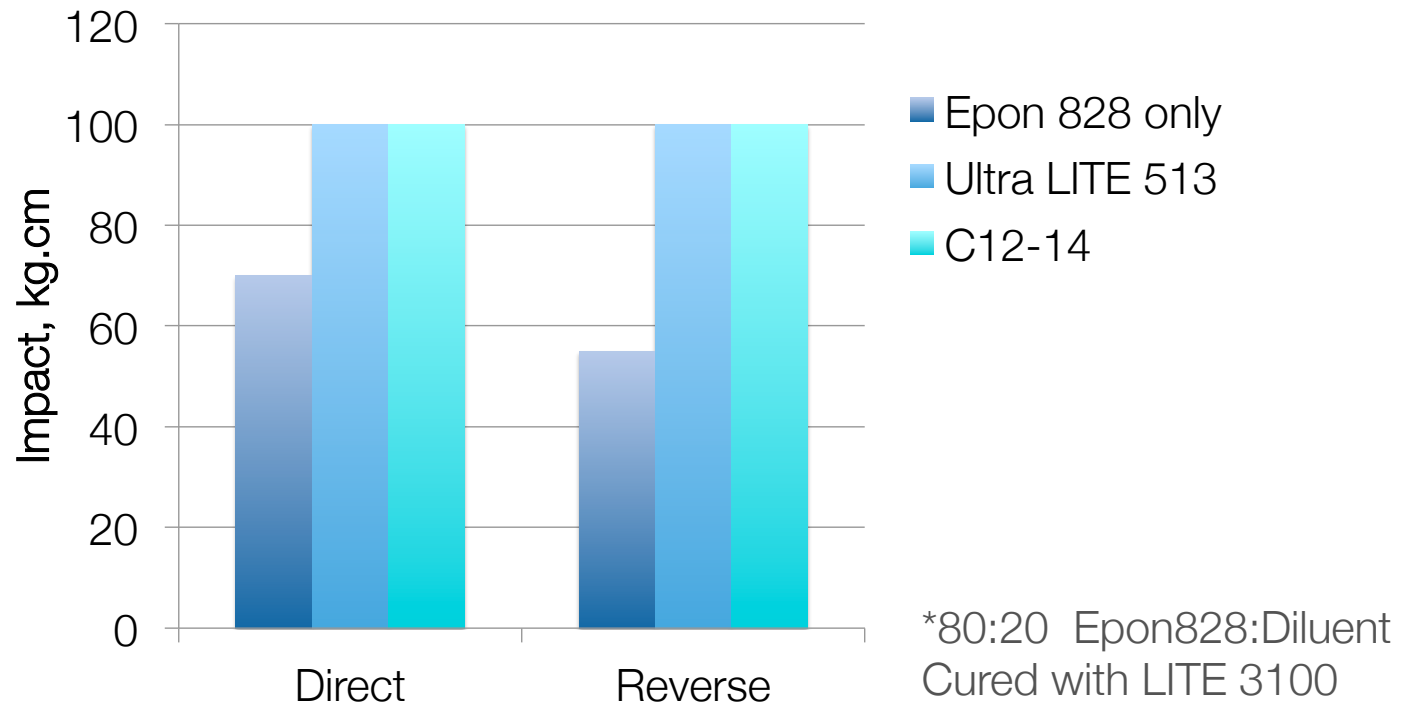
Ultra LITE 513 shows faster dry time than C₁₂-C₁₄ glycidyl ether type diluent at room and low temperatures.



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Impact



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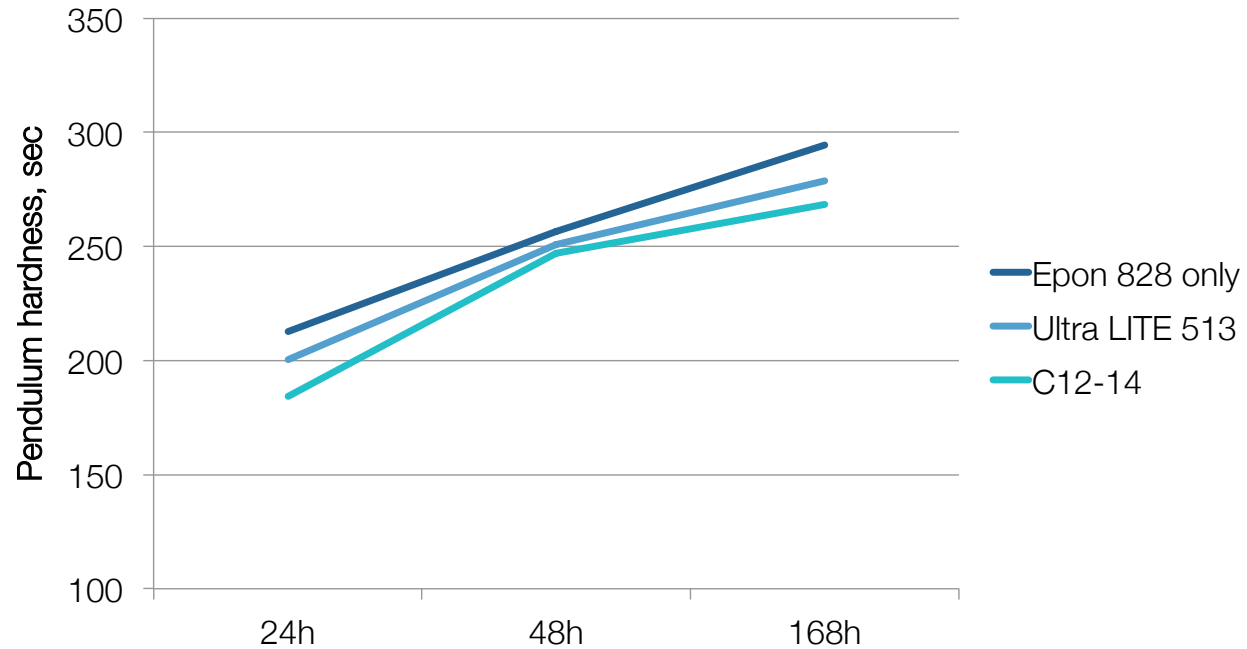
Ultra LITE 513 improves impact resistance of unmodified Epon 828 system.



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Hardness Development



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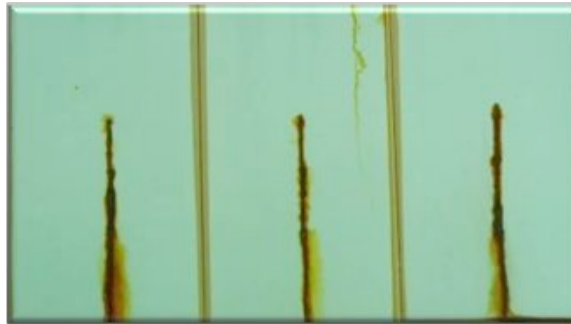
Ultra LITE 513 shows faster hardness development than C_{12} - C_{14} glycidyl ether type diluent.



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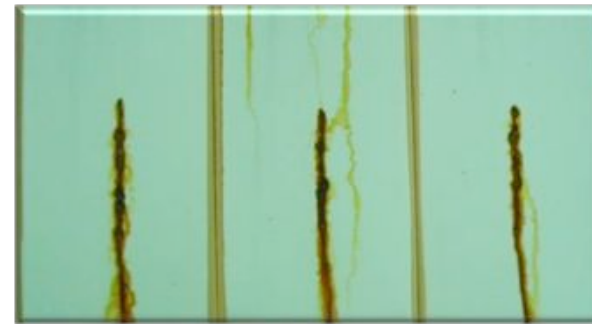
500 hrs Salt Spray

Ultra LITE 513



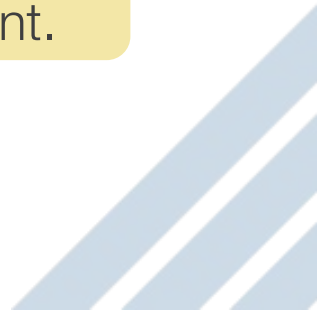
Rust: none
Blister: #4, very few

C₁₂-C₁₄ Glycidyl Ether



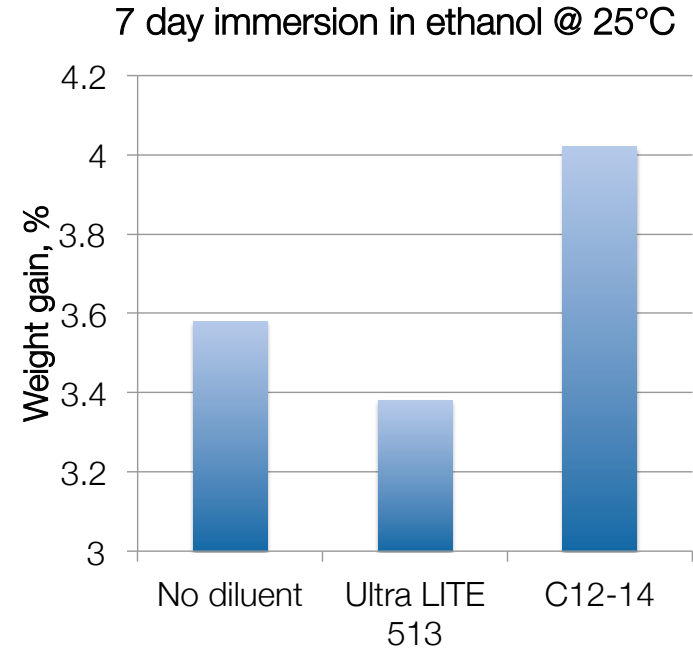
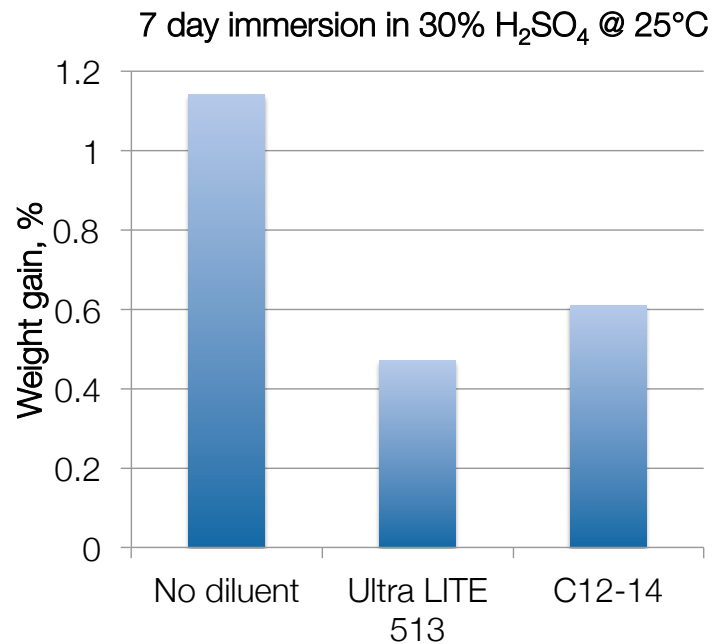
Rust: #9 very few rust spots
Blister: #4, very few

Ultra LITE 513 shows slightly better corrosion protection than C₁₂-C₁₄ glycidyl ether type diluent.



Chemical Resistance

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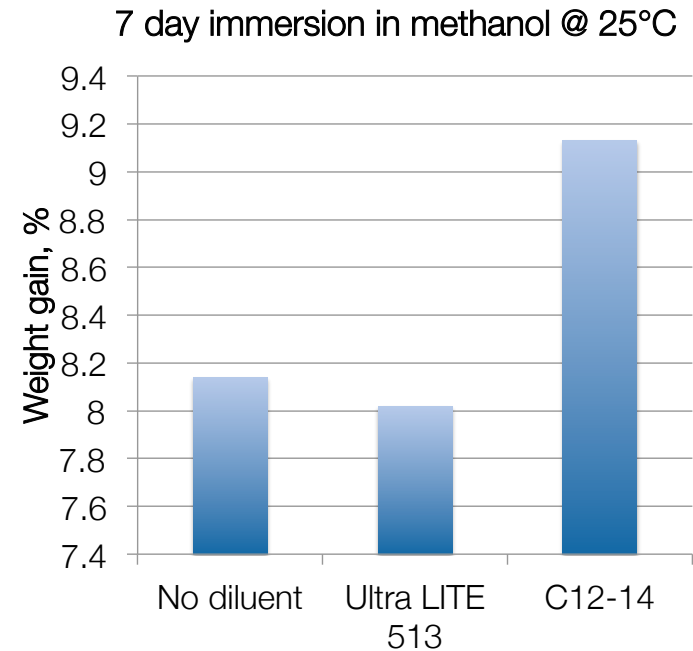
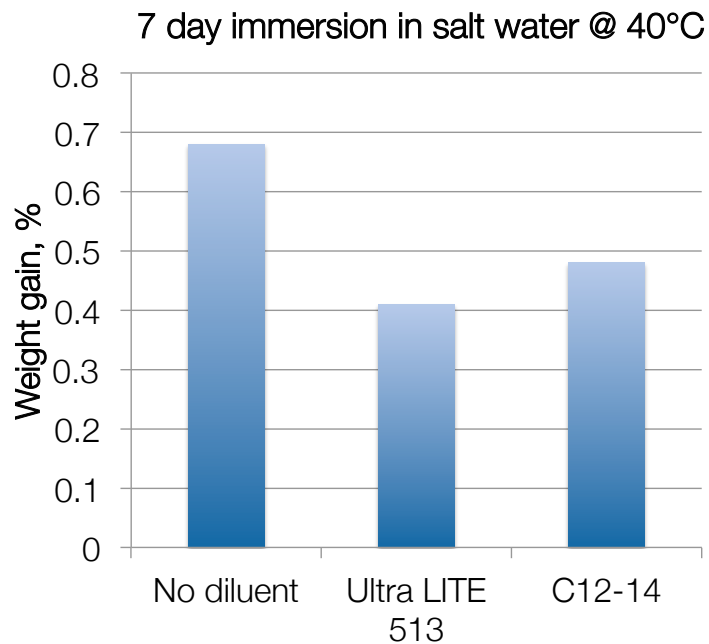


- Ultra LITE 513 can improve sulfuric acid and ethanol resistance of epoxy systems.
- Ultra LITE 513 shows better performance than C₁₂-C₁₄ glycidyl ether type diluent.



Chemical Resistance

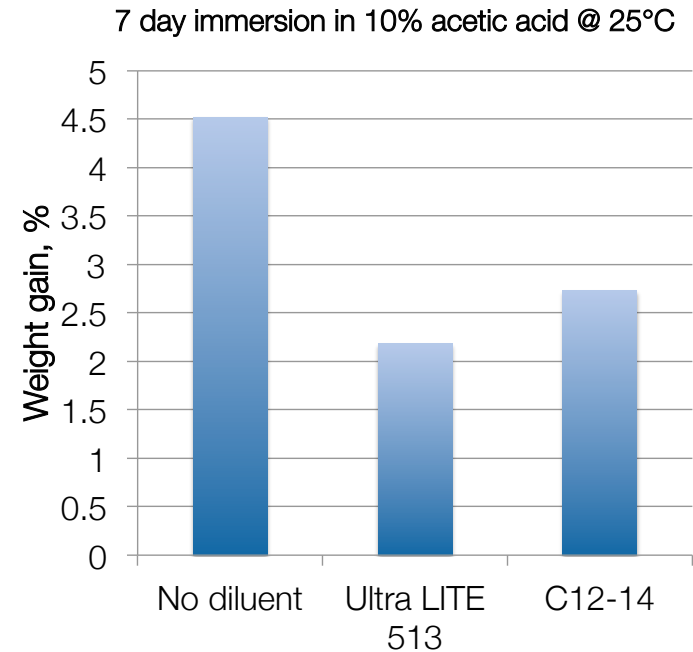
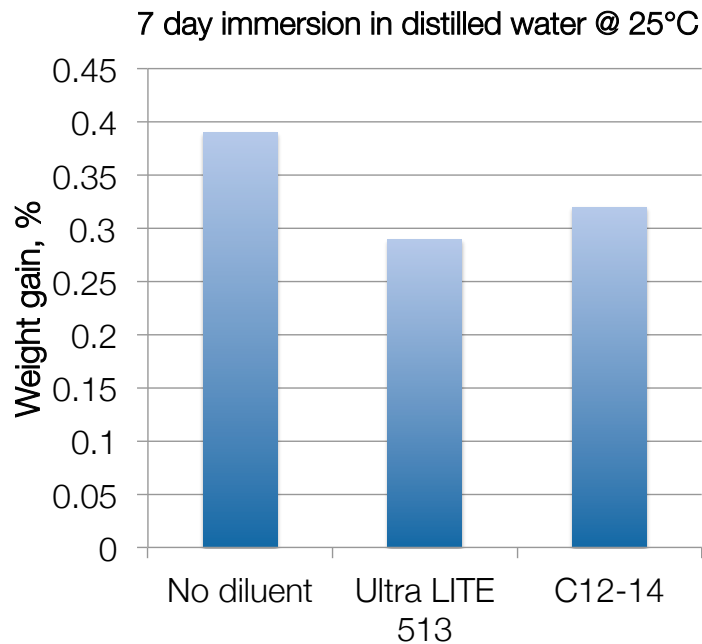
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- Ultra LITE 513 can improve salt water and methanol resistance of epoxy systems.
- Ultra LITE 513 shows better performance than C₁₂-C₁₄ glycidyl ether type diluent.



Chemical Resistance



- Ultra LITE 513 can improve distilled water and acetic acid resistance of epoxy systems.
- Ultra LITE 513 shows better performance than C₁₂-C₁₄ glycidyl ether type diluent.



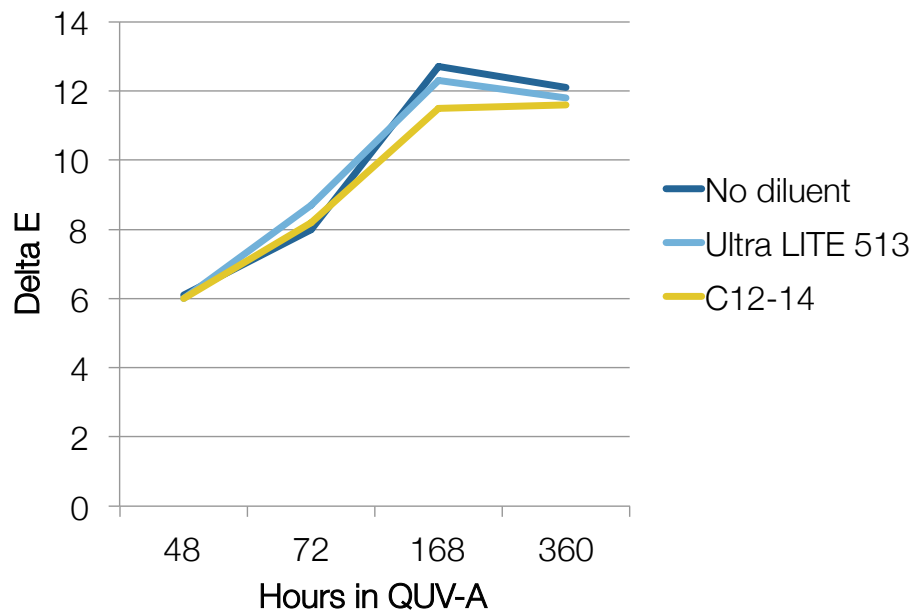
Pigmented Formulation for QUV

Material	Amount
EPON 834	24.89
XYLENE	14.29
N-BUTYL ALCOHOL	6.12
BYK-163	0.50
TITANIUM DIOXIDE	20.00
MICA	25.16
BARIUM SULFATE	9.05
Part A total	100
Ultra LITE 513 / C12-14	4.98 / 4.98
NX-2009	11.16 / 11.56

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Color Stability



Ultra LITE 513 @ 168hr



C12-14 @ 168hr



Ultra LITE 513 and C₁₂-C₁₄ glycidyl ether type diluent give comparable yellowing.





Conclusion

Ultra LITE Series Epoxy Modifiers offer:

- Excellent dilution efficiency
- Cure acceleration (non-reactive)
- Faster hardness development
- Water resistance and corrosion protection
- Increased flexibility and impact
- Improved chemical resistance
- Good color stability compared to other modifiers
- Renewable, non-toxic options

