

Y K W W M C

Cationic UV Curing

Speeding up reactivity 15x with Curalite™

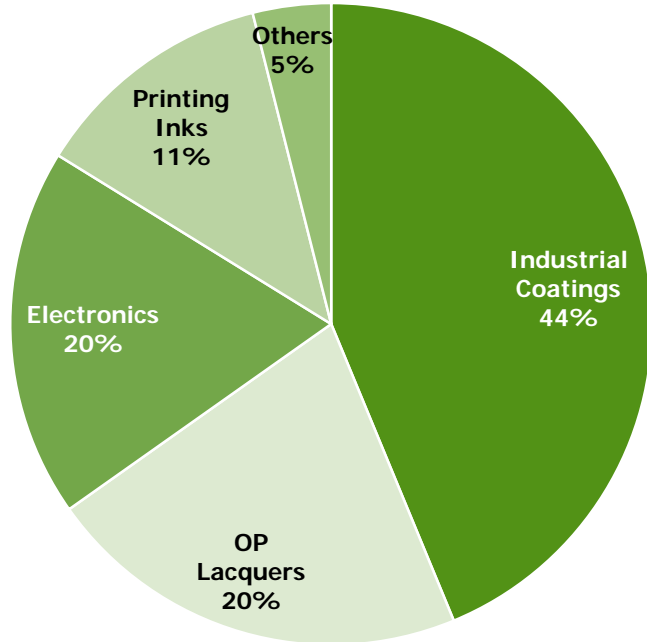


Different types of curing for food packaging

Technology	Advantages	Disadvantages/myths
Solvent and oil based	<ol style="list-style-type: none"> 1. Long history and experience 2. Low cost 3. Variety of materials 	<ol style="list-style-type: none"> 1. High VOC 2. Slow drying 3. Migration
Water based	<ol style="list-style-type: none"> 1. Seen as "safe" 2. Low VOC 	<ol style="list-style-type: none"> 1. Low solids 2. Slow drying 3. Limited suitability on impermeable substrates 4. Migration
Radiation curing	<ol style="list-style-type: none"> 1. Space saving 2. Production speed 3. Versatile 4. VOC-free 5. Low energy 6. Low migration 7. Enhanced print quality 	<ol style="list-style-type: none"> 1. Often perceived as hazardous 2. <u>Acrylates</u> can have poor adhesion 3. Curing must be carefully controlled 4. Seen as high cost

Radiation curing applications

2016: 550,000 Tonnes



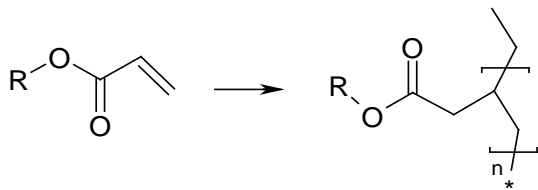
Reduction in traditional printing inks, increase in electronics and digital 3D

Two types of Radiation cure

Free radical curing

The dominant technology >95%

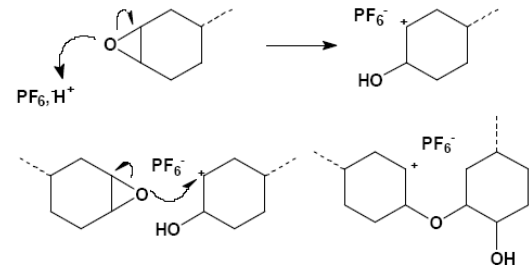
Curing by use of a radical generating photo-initiator or electron beam



Cationic curing

<5% of Radcure market

Curing by use of a "Lewis acid" generating photo-initiator



Comparison of UV technology

Technology	Advantages	Disadvantages
Radcure Free radical >95%	<ol style="list-style-type: none"> 1. Space saving 2. Speed 3. Versatile 4. VOC-free 5. Low energy 6. High quality/ high resolution 	<ol style="list-style-type: none"> 1. Often perceived as unsafe 2. <u>Acrylates</u> can have poor adhesion 3. Curing must be carefully controlled 4. Curing is affected by O₂.
Radcure Cationic <5%	<ol style="list-style-type: none"> 1. All of above 2. Exceptional adhesion on difficult substrates 3. No "Oxygen inhibition" 4. High chemical resistance 5. Exceptional flexibility 6. Low migration 7. Safe 	<ol style="list-style-type: none"> 1. Affected by amines and humidity 2. Limited range of raw materials



Main applications for cationic curing

Graphic Arts

Exceptional adhesion giving low migration in sensitive applications like food packaging



Coatings

Outlasting performance on difficult substrates like metal, glass and plastic



Other

- ➔ Adhesives
- ➔ Silicone release agents
- ➔ Electronics



Cationic UV is the perfect choice for challenging applications

Cationic on challenging substrates

Plastics

- ➔ Polyethylene
- ➔ Oriented Polypropylene
- ➔ Polyester
- ➔ Polyacrylates
- ➔ Polycarbonate
- ➔ Polystyrene
- ➔ Polyvinyl Chloride
- ➔ Acrylonitrile-Butadiene-Styrene
- ➔ Thermoplastic Polyurethanes
- ➔ Polyamides



Metals

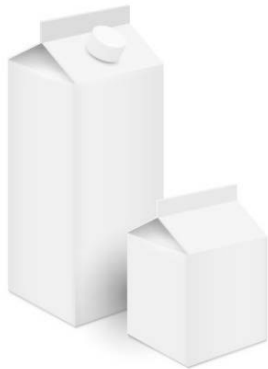
- ➔ Aluminium
 - Vacuum deposited
 - Annealed
 - Foils
 - Drawn containers
 - Monobloc
- ➔ Tin-plate
- ➔ Tin-free steel



Why cationic is great

Carton packaging

- ➔ Flexo printed
- ➔ Carton packaging for retorted food
- ➔ Alternative to traditional cans



Decorative Sleeves

- ➔ Shrink sleeves
- ➔ “Gravure quality” print
- ➔ High shrinkage
- ➔ Superior scratch resistance



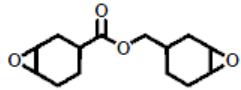
Beverage can-base

- ➔ Long term resistance and fast process
- ➔ Designed for slip and resistance

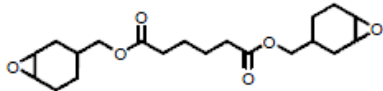


The Cationic formulation

Cyclo-aliphatic Epoxy

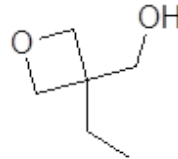


CAS No. 2386-87-0 UVR6105



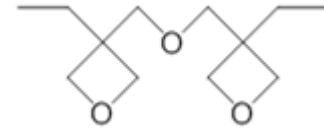
CAS No. 3130-19-6 UVR6128

Reactive Diluent



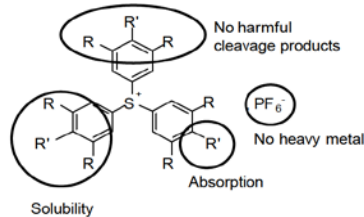
Curalite™ Ox

Crosslinker



Curalite™ OxPlus

Initiator



Irgacure 270

Modifiers – Polyols

- ➔ Polyether polyols
- ➔ Caprolactone polyols
- ➔ Dendritic “Boltorn” polyols

Others

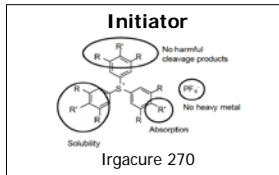
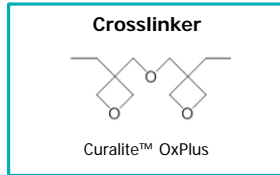
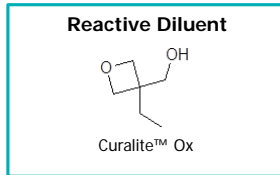
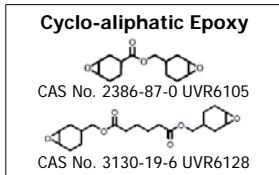
- ➔ Additives
- ➔ Pigments
- ➔ Fillers

Our offer for Cationic formulation

Reactive diluent/Crosslinker

➔ Curalite™

Oxetane performance boosters



- Modifiers – Polyols**
- ➔ Polyether polyols
 - ➔ Caprolactone polyols
 - ➔ Dendritic “Boltorn” polyols

- Others**
- ➔ Additives
 - ➔ Pigments
 - ➔ Fillers

Modifiers – Polyols

Boltorn™

Multifunctional and highly branched dendrimers

Alkoxyates

High reactivity and safe polyethers



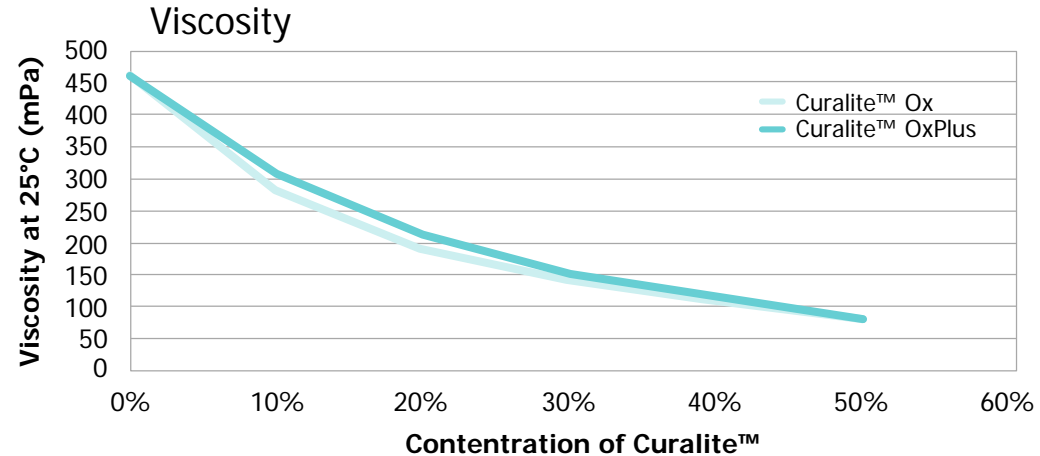
Introducing Curalite™

- ➔ Increasing reactivity enabling faster printing speed
- ➔ Lowers viscosity
- ➔ Curalite™ Ox and Curalite™ OxPlus
- ➔ High availability of fresh material
- ➔ Non skin-irritating and low odor
- ➔ Fast and reliable supply
- ➔ Flexibility in order sizes

Curalite™ – Designed to enhance Cationic UV Curing

Reactive diluent

Modifiers – Polyols



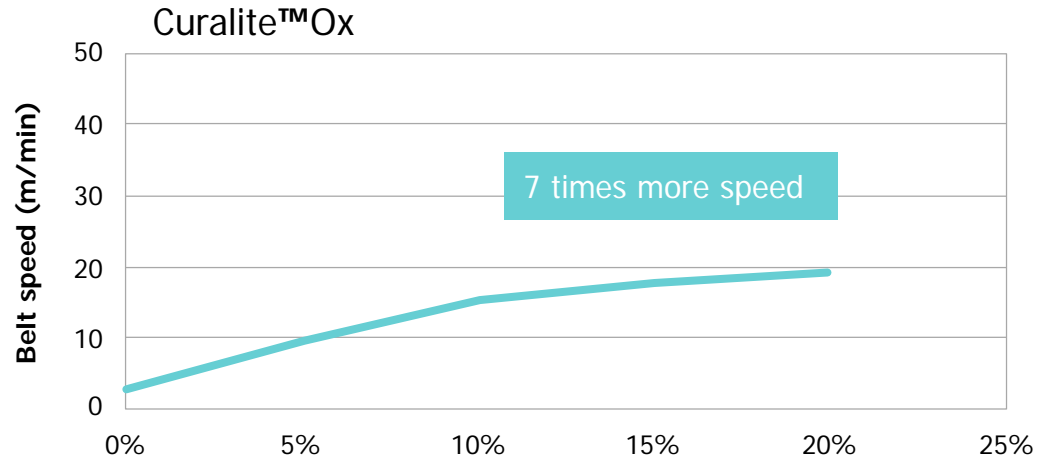
Curalite™ Ox

- ➔ Increasing the reactivity up to 7 times
- ➔ Best performance for flexibility
- ➔ Suitable in formulation in the range of 5 to 20%
- ➔ Increased dark cure gives increased through cure

Reactive diluent

Modifiers – Polyols

Speeding up your
cationic formulation



Curalite™ OxPlus

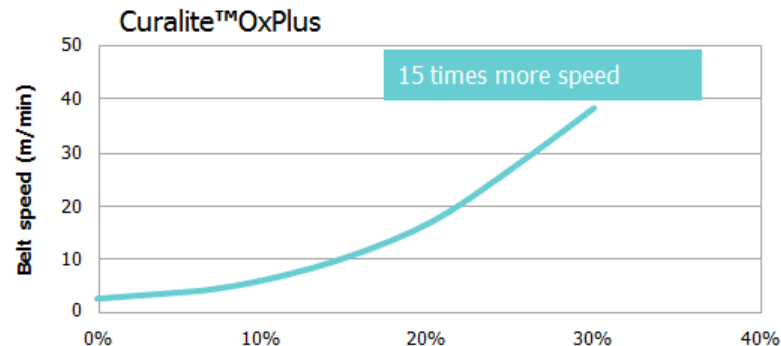
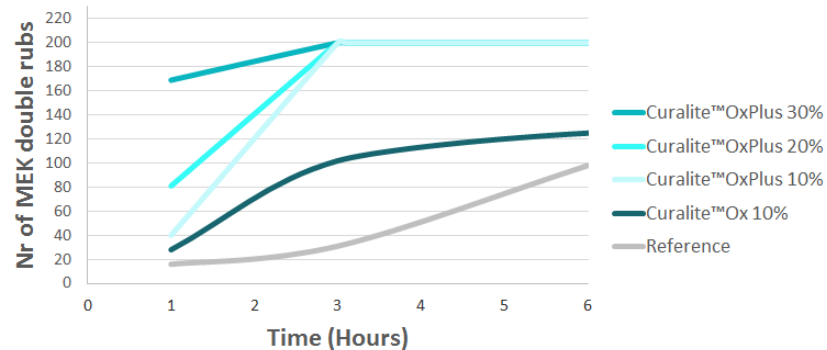
Give your formulation an extra edge

- ➔ A di-functional Oxetane crosslinker
- ➔ Improved chemical resistance and hardness
- ➔ Increasing the reactivity up to 15 times
- ➔ Suitable in formulation in the range of 10 to 40%
- ➔ Use less amounts of expensive photoinitiator
- ➔ Perfect for environments with high humidity

Reactive diluent

Modifiers – Polyols

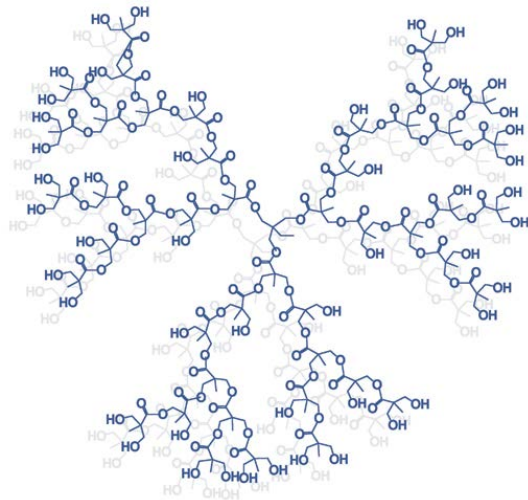
Superior Through Cure



Dendritic Polymers – “Boltorn”

Hyperbranched Polymers

- ➔ High functionality
- ➔ Densely branched polymer backbone



Reactive diluent

Modifiers – Polyols

Boltorn™ H2004 recommended for cationic formulation

- ➔ Superior wear resistance, improved flexibility and rheological behavior
- ➔ Improves ink flow
- ➔ Improved flexibility
- ➔ Offers good cross-linking

Polyether polyol

Broad offer in **polyols**
for **cationic formulations**

- › Di-, tri- and tetra functional polyols
- › Ether bonds

Tailoring properties

Changing polyol and the ratio between
epoxide/oxetane and polyol

Alkoxyates for freedom when formulating



Reactive diluent

Modifiers – Polyols



A photograph showing a long, perspective view of a production line filled with rows of aluminum cans. The cans are arranged in neat, parallel rows that recede into the distance. The lighting is bright, highlighting the metallic surfaces of the cans. The background is slightly blurred, showing industrial equipment and green overhead structures.

Contact us for more information

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