



Cardolite

The World Quality Leader in Cashew Liquid Technology

| Coating Products Portfolio





CARDOLITE CORPORATION

Cardolite Corporation manufactures the world's largest variety of products derived from cashew nutshell liquid (CNSL), a renewable natural resource. The unique properties of CNSL are used to develop and produce a wide range of specialty epoxy curing agents, resins, and diluents for marine, heavy duty, industrial, and floor coating applications.

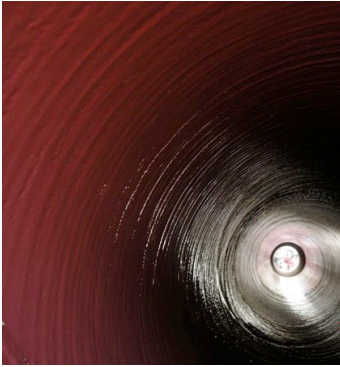
With over 20 years of experience, Cardolite is the leader in the production of quality CNSL based materials used in the epoxy coatings industry. The company's customer base includes all types of coating companies ranging from the world's largest paint producers to small specialty manufacturers. With sales offices, representatives, and distribution facilities in North America, Europe, and Asia, Cardolite prides itself on delivering high quality products and service across the globe.

Cardolite Corporation manufactures all products at production plants in Newark, New Jersey (USA) and Zhuhai, Guangdong (China). With well over 35,000 T/yr of total capacity for the epoxy product line, these facilities are designed to support the most demanding customers. Both Cardolite facilities are ISO 9000 registered and adhere strictly to local and best practice health, safety, environmental, and security standards.

Cardolite continues to invest heavily in its epoxy product line in the areas of new product research, technical application support, and manufacturing capability. These investments, along with continued close customer cooperation, will ensure the needs of the coatings industry continue to be met by naturally renewable CNSL-based products.



EPOXY CURING AGENTS



Cardolite's line of epoxy curing agents is based on phenalkamine technology, a novel chemistry using cardanol, the natural phenolic compound derived from cashew nutshell liquid. Phenalkamine curing agents bring unique benefits to epoxy coating systems that are difficult or expensive to achieve using traditional epoxy curing technologies. The ability to formulate high solids coatings with rapid cure at temperatures near or below freezing has made phenalkamine curing agents the standard in high performance heavy duty applications, such as the highly demanding marine industry. Environmental regulations and the need to improve work efficiency continue to pressure all heavy duty coatings applications, and Cardolite curing agents are a simple solution to these difficult technical challenges.

Some of the unique benefits provided by Cardolite's phenalkamine epoxy curing agents include:

- Formulate for high, ultra high, and 100% solids while retaining low viscosity
- Rapid and low temperature cure
- Excellent flexibility
- Highly tolerant of damp or poorly prepared surfaces
- Non-critical mix ratio
- Outstanding corrosion resistance
- Safe for potable water and food contact coatings*

EPOXY CURING AGENT PROPERTY SELECTION CHART

PROPERTY	NC-541 LITE 2001	NC-541LV LITE 2001LV	LITE 2002 NX-4901	NC-562 LITE 2562	NX-5406 NX-5444
VISCOSITY @ 25°C (cPs)	30,000	2,500	260-800	1,000-2,000	3,500-4,500
AMINE VALUE (MG KOH/G)	320	340	360	185	200-230
COLOR (GARDNER)	17/10	16/10	10	14/9	8
ACTIVE HYDROGEN EQUIVALENT (AHEW)	130	125	104/114	174	190/300
THIN FILM SET TIMES @ 25°C/5°C (200 MICRON)	7/18 HRS	13/40 HRS	7/20 HRS	4/9 HRS	1/5 HRS
KEY PROPERTIES	- Solvent free - Low temperature cure - Good corrosion resistance - FDA listed (NC-541)	- Low viscosity - Solvent free - Low temperature cure - Good for very high solids systems	- Low viscosity - Use in 100% solids systems - Low temperature cure - Good potlife	- Very fast cure - 65% solids - Good potlife - Good for high solids systems - Early recoatability	- Rapid cure - Good flexibility - 80% solids - Good overcoatability - Blush/oil free surface formation

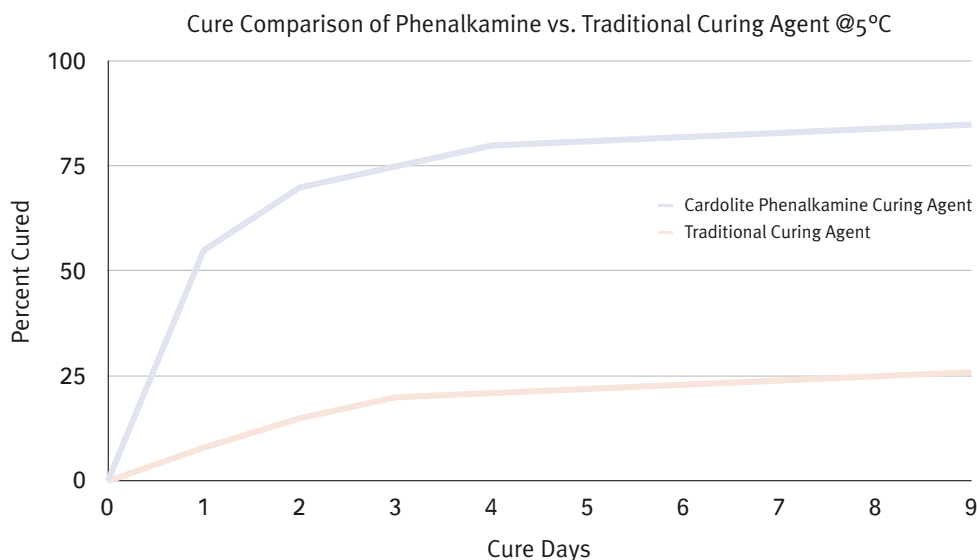
PROPERTY	NC-556X80	NC-540	NC-558	NX-2003	NC-566	NX-4943
VISCOSITY @ 25°C (cPs)	6,000	2,500	900	500-1,200	2,550	1,500
AMINE VALUE (MG KOH/G)	320	500	340	350	361	488
COLOR (GARDNER)	14	17	17	15	17	14
ACTIVE HYDROGEN EQUIVALENT (AHEW)	135	81	95	95	95	82
THIN FILM SET TIMES @ 25°C/5°C (200 MICRON)	5/16 HRS	10/20 HRS	12/38 HRS	7/25 HRS	2/10 HRS	6/20 HRS
KEY PROPERTIES	- Fast cure - 75% solids - Early sandability - Quick dry to handle - FDA approved*	- Low viscosity - Poor and damp surface tolerant - Solvent free - Good chemical resistance	- Low viscosity - Poor and damp surface tolerant - Solvent free - Usable in potable water	- Fast cure - Poor and damp surface tolerant - Solvent free - Good corrosion and chemical resistance	- Very fast cure - Solvent free - Low temperature cure	- Low viscosity - Solvent free - Good chemical resistance

* Not all Cardolite curing agents are FDA approved or safe for potable water use. Some also require specific curing conditions. Ask your Cardolite sales representative for details on developing FDA and potable water safe coatings.

EPOXY CURING AGENT APPLICATION SELECTION CHART

	NC-541 LITE 2001	NC-541LV LITE 2001LV	NC-562 LITE 2562	LITE 2002 NX-4901	NX-5406 NX-5444	NC-558 NX-2003	NC-540	NC-556X80
MARINE, HEAVY DUTY, AND GENERAL INDUSTRIAL COATINGS								
HIGH SOLIDS (≥65%)	✓		✓					
ULTRA HIGH SOLIDS (≥80%)		✓			✓			
SOLVENT FREE		✓		✓				
TRANSPORTATION PRIMERS								
HIGH SOLIDS (≥65%)			✓					✓
ULTRA HIGH SOLIDS (≥80%)								✓
POTABLE WATER PIPE/TANK COATINGS								
SOLVENT BASED	✓	✓					✓	
SOLVENT FREE		✓		✓		✓	✓	
CONCRETE PRIMERS								
SOLVENT BASED			✓					
SOLVENT FREE		✓		✓		✓	✓	

PHENALKAMINE LOW TEMPERATURE CURE PERFORMANCE



FORMULATION SUPPORT AND CUSTOM DEVELOPMENT

Cardolite has broad expertise and experience supporting, developing, and manufacturing curing agent solutions to fit specific customer needs. If a standard Cardolite product does not function as desired for a specific application, Cardolite can provide formulation technical support and custom modifications from as simple as a solvent cut to as complex as altering the curing agent's fundamental properties.

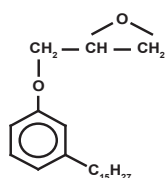
EPOXY DILUENTS & RESINS



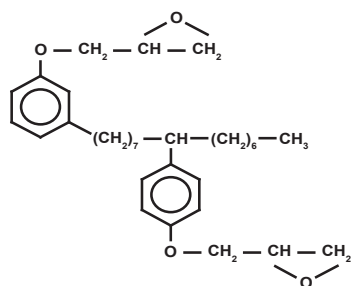
In addition to phenalkamine curing agents, Cardolite offers a line of cardanol derived epoxy resins and diluents that provide tools to formulators looking to add unique properties to their coatings.

CARDOLITE® NC-513/LITE 2513HP

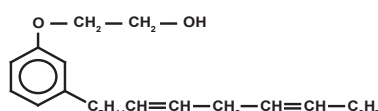
Cardolite® NC-513 and LITE 2513HP are mono-functional reactive epoxy diluents that can be used to increase the flexibility, impact resistance, chemical resistance, and water resistance of epoxy coatings. These reactive diluents have very low viscosity and low volatility, which make them ideal for helping formulate high solids and solvent free coatings. Good reactivity means these diluents react completely into the coating network, and offer low migration levels for the resulting coating. LITE 2513HP is a lower viscosity, higher purity, and lighter colored version of NC-513; they are both identical in chemical make-up.



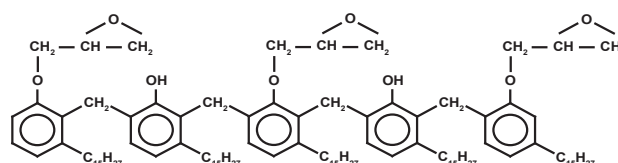
Cardolite® NC-513/LITE 2513HP



Cardolite® NC-514



Cardolite® LITE 2020



Cardolite® NC-547

CARDOLITE® NC-514/NC-547

Cardolite® NC-514 and NC-547 are, respectively, di-functional and tri-functional reactive epoxy resins. These high viscosity resins can be used in conjunction with traditional epoxy resins to increase the flexibility, water resistance, and chemical resistance of coatings without adversely affecting other properties.

CARDOLITE® LITE 2020*

Cardolite® LITE 2020 is a low viscosity multi-purpose resin modifier. This resin is 100% non-volatile and is therefore useful for formulating environmentally friendly high solids coatings. Due to its unique chemical structure, LITE 2020 is more efficient than traditional hydrocarbon resins in reducing viscosity despite being higher in viscosity. Its hydrophobic nature also allows for good corrosion resistance and early water resistance.

EPOXY DILUENT & RESIN PROPERTY CHART

PROPERTY	NC-513	LITE 2513HP	NC-514	NC-547	LITE 2020
VISCOSITY @ 25°C (cPs)	50	30	25,000	30,000	90
EPOXY EQUIVALENT WEIGHT (EEW)	490	400	490	550-850	N/A
COLOR (GARDNER)	<11	6	17	18	14 MAX
HYDROLYZABLE CHLORINE (%)	<2%	<2%	<2%	2.5 MAX	N/A
RECOMMENDED PHR (LIQUID EPOXY RESIN, EEW=190)	2-20	2-20	2-25	-	2-20
SOLIDS (%)	SOLVENT FREE	SOLVENT FREE	SOLVENT FREE	SOLVENT FREE	>98.5%

* Cardolite LITE 2020 is not approved for sale in Europe.



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