

Crosslinker CX-100

Crosslinker CX-100 is a 100% active polyfunctional aziridine liquid crosslinker. Addition of one to three percent Crosslinker CX-100 to acrylic emulsions or waterborne urethane polymers produces a marked improvement in water, chemical, abrasion, and humidity resistance. It is ideal for use with fast air-dry NeoCryl acrylic emulsions, NeoRez waterborne urethane and NeoPac urethane acrylic copolymer products. In addition, Crosslinker CX-100 can be used with solvent based systems provided reactive carboxyl functionality is present. Similar property improvements should be expected.

Key Benefits

- Crosslinked Properties Obtained at Room Temperature
- Improved Water, Alcohol and Print Resistance
- Increased Chemical, Stain and Abrasion Resistance

Suggested Markets: Crosslinker CX-100 can be used in coating for any end use, where improved performance is desired.

Typical Properties

Type	Propylene imine
Percent active, %	100
Viscosity, cps @ 25°C	200
Density, lbs/gal	8.9
Stability, room temperature	12 months

WARNING: For Industrial Use Only

Bulletin CX-100
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DSM NeoResins Inc. 730 Main Street, Wilmington, MA 01887-3386, USA Tel (800) 225-0947 Fax: (978) 657 7978 Internet www.dsmneoresins.com
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FORMULATIONS AND APPLICATIONS

Crosslinker CX-100 can be used to crosslink polymers with reactive carboxyl functionality. It is a multi-functional material with an equivalent weight of 156. For many applications, 0.6 equivalents of Crosslinker CX-100 are sufficient to achieve the optimum improvement in film properties. However, some systems may require the full stoichiometric equivalent of crosslinker.

Table I summarizes property advantages of incorporating Crosslinker CX-100 into waterborne and solvent systems. The results for NeoCryl A-601 and NeoRez R-960 are typical, and similar improvement can be achieved by using the crosslinker with other NeoCryl emulsions, NeoRez waterborne urethanes and NeoPac urethane acrylic dispersions as well as solvent borne acrylic lacquers.

TABLE I
Formulation and Properties of Crosslinker CX-100

FORMULATION: (Parts by Weight)

NeoCryl A-601 (acrylic emulsion)	100	100				
NeoRez R-960 (urethane emulsion)			100	100		
NeoCryl B-723 (acrylic lacquer) ^(a)					100	100
Crosslinker CX-100 ^(b)	--	2	--	3	--	1

FILM PROPERTIES: ^(c)

Impact, in-lbs., Pass/Fail						
direct	10/12	40/50	160/-	160/-	40/50	60/70
rev.	8/10	10/12	160/-	160/-	10/12	10/12
Flexibility, inches, pass						
Conical Mandrel	4	8	8	8	8	8
Mar Resistance ^(d)	4	8	6	9	4	4
Chemical Resistance ^(d)						
IPA	1	10	1	10	1	8
Toluene	1	8	10	10	1	1
Water	3	8	7	10	7	8

(a) 20% NV/Toluene

(b) Calculated stoichiometric amount, based on reactive functional groups in polymer, 0.6 equivalents used with NeoCryls A-601 and B-723. 1.0 equivalents used with NeoRez R-960.

(c) Approximately 1 mil dry film draw down on cold roll steel, air dried overnight.

(d) 10 = excellent 1 = poor

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SOLUBILITY

Crosslinker CX-100 is compatible with a variety of solvents at 70% solids. See Table II.

TABLE II

	<u>Initial</u>	<u>7 day @ 70°C</u>
Water	Complete	Gelled
Butyl Cellosolve	Complete	OK
Propasol B	Complete	Sl. Sediment
Texanol	Complete	OK
T-Butyl Alcohol	Complete	Sl. Sediment
Carbitol	Complete	OK
Butyl Carbitol	Complete	OK
Carbitol Acetate	Complete	OK
Arcosolve DPM	Complete	Sl. Sediment
Arcosolve PM	Complete	Sl. Sediment

STABILITY AND HYDROLYSIS

Solvent-based systems modified by the addition of Crosslinker CX-100 must be used within 5 days because they tend to thicken and may gel within 2 weeks.

In waterborne systems Crosslinker CX-100 will slowly hydrolyze and should be used within 1-3 days after preparation. Hydrolyzed Crosslinker CX-100 has no adverse effect on either the latex or dried film resistance properties. However, film hardness may suffer as the deactivated crosslinker acts to plasticize the film. A 2/1 or 3/1 blend of fresh to aged formula is recommended before re-inoculation with crosslinker at the original amount to maintain formula consistency. Table III illustrates the reactivity of Crosslinker CX-100 versus time in a typical waterborne system:

TABLE III
NeoCryl A-601/Crosslinker CX-100
Film Chemical Resistance ^(a)

	Isopropanol	Toluene	Water
No Crosslinker	1	1	3
2% (just mixed)	10	8	8
Aged 3 days	9	7	8
Aged 7 days	6	4	6
Re-inoculated (1%) ^(b)	10	8	8

^(a) 10 = Excellent, 1 = Poor

^(b) Waterborne systems aged more than 7 days may require 2% re-inoculation for optimal performance.

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TOXICITY DATA

An acute oral toxicity study with Crosslinker CX-100 produced an LD₅₀ value of 3,038 mg/kg. This places it in a category of toxic materials with a value which is similar to common solvents such as methyl ethyl ketone and toluene.

A primary skin irritation value of 2.65 was obtained out of a possible score of 8. Compounds producing a primary irritation value of 5 or greater are defined as "primary skin irritants".

Crosslinker CX-100 was found to be a primary eye irritant and corrosive effects were indicated.

Crosslinker CX-100 was tested for potential mutagenic activity in microbial assays using the reverse mutation technique described by Ames. A dose-related increased reversion frequency over the spontaneous rate was obtained and a value of 0.18 revertant per microgram was calculated. Although positive, the level of response is measurable low.

Mixtures of NeoCryl A-601 latex with the recommended amount of Crosslinker CX-100 were tested immediately upon mixing, and at various elapsed times. None of the mixtures showed any genetic response in the Ames Test. This indicates that the coating vehicle containing Crosslinker CX-100 before and during applications does not have any measurable mutagenic activity, although the title compound, Crosslinker CX-100, is mildly active.

Films of NeoRez R-960 and NeoCryl A-601 containing recommended amounts of Crosslinker CX-100 crosslinker did not demonstrate any mutagenic activity in any of the assays tested. It can, therefore, be concluded that dried films incorporating Crosslinker CX-100 as a crosslinker can be considered non-mutagenic by the test conditions described by Ames.

HANDLING

Care must be taken to avoid any contact with the skin and eyes. When used in spray applications, particular care must be taken to avoid oral and/or nasal ingestion. Eye protection, gloves and suitable clothing must be worn to avoid contact with skin and eyes. In addition, a suitable respirator must be worn for spray applications.

Where spillage of Crosslinker CX-100 occurs, the area should be thoroughly flushed with water. This will hydrolyze the Crosslinker CX-100 and make it easier to clean. If more rapid cleaning is desirable, a 5% solution acetic acid or a mineral acid can be used.

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Technical Information

HANDLING, (Cont'd)

Containers of Crosslinker CX-100 must show the following warning:

HANDLE WITH CARE

USE ONLY WITH ADEQUATE VENTILATION. AVOID CONTACT WITH SKIN OR EYES AND BREATHING OF SPRAY MIST. IN CASE OF SKIN OR EYE CONTACT, FLUSH THOROUGHLY WITH PLENTY OF WATER. FOR EYES, ALSO CALL PHYSICIAN. CLOSE CONTAINER AFTER EACH USE. KEEP OUT OF REACH OF CHILDREN. STORE IN COOL, DARK PLACE.

For more detailed information on handling and precautions, see Material Safety Data Sheet.

STORAGE CONDITIONS

Store in a cool, dry, dark place. If stored under conditions of excessive heat for extended periods, the material may discolor, deteriorate, and even gel.

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Technical Information

Raw Material Suppliers

Material

Supplier

Carbitol
Carbitol Acetate
Butyl Cellosolve
Propasol B
Propasol P

Union Carbide Corporation
(800) 335-8550

Arcosolve DPM
Arcosolve PM

Lyondell Chemical
(800) 321-7000

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