Industrial Coatings

Technical Data Sheet

Joncryl® 500 Polyol

We create chemistry

Product Description **Joncryl® 500 is a low VOC acrylic polyol for polyurethane and melamine crosslinked coatings.**

Key Features & Benefits

- ***Narrow molecular weight distribution***
- ***Outstanding application properties***
- ***Improves application properties of polyesters***
- ***Low VOC capability***

Chemical Composition **Acrylic polyol**

Properties

Typical Properties

Appearance	clear liquid
Hydroxyl number	~ 150
Non-volatile at 150°C (0.5g, 60 minutes)	~ 81.5%
Viscosity at 25.0 ± 0.5°C (Brookfield #4LV, 60 rpm, 30 seconds)	~ 5,200 cps
Density at 20°C	1.03 g/cm^3 (8.55 lbs/gal)
Equivalent weight as supplied, of solids	500, 400
Tg (measured)	- 7°C (19.4°F)
Solvent	Methyl n-amyl ketone
Freeze-thaw stable	Yes

These typical values should not be interpreted as specifications.

Applications

Joncryl® 500 is an innovative hydroxyl functional acrylic polymer for high solids systems. Coatings formulated with Joncryl® 500 features a low viscosity at high solids and excellent flow and leveling exhibiting good durability. High solids polyurethane coatings can be formulated below 2.6 pounds per gallon of Volatile Organic Compounds without the use of exempt solvents. Joncryl® 500 can also be used in melamine crosslinked coating systems. This acrylic is available in several alternative solvents.

Joncryl® 500 is recommended for applications such as:

- Interior/exterior automotive refinish applications
- Interior/exterior general metal industrial coating applications

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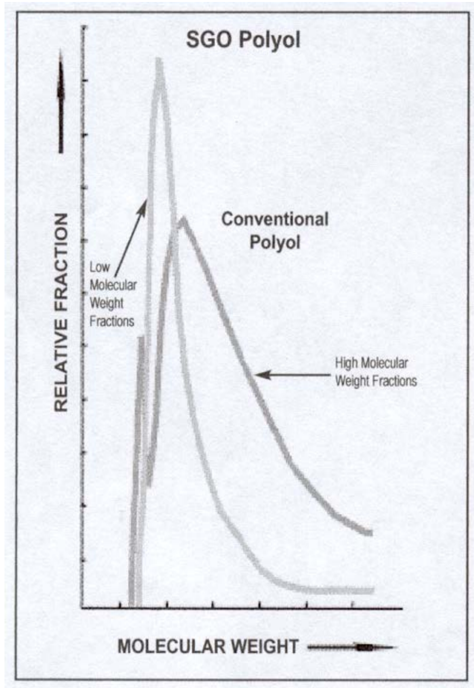
SGO Polymerization Process

Joncryl® 500 is produced by the patented SGO (Solid Grade Oligomer) polymerization process, which makes extremely narrow molecular weight distributions possible. The poly-dispersity of Joncryl® 500 is 1.7, which is considerably less than oligomers produced by conventional polymerization methods.

The following graph compares the molecular weight distribution of Joncryl® 500 versus a competitive high solids acrylic polyol.

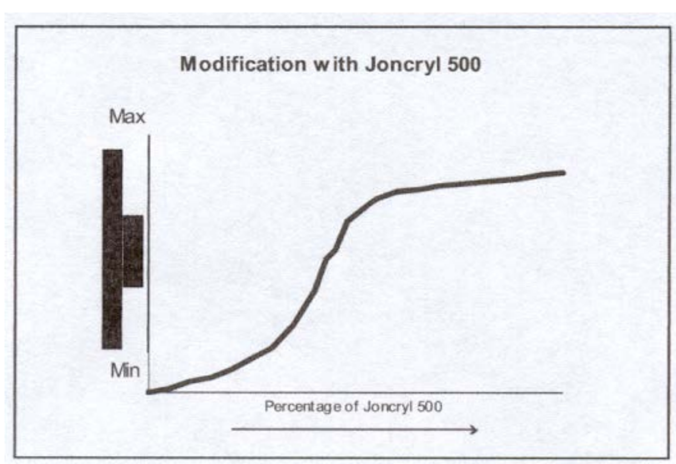


The following table illustrates the benefits of a narrow molecular weight distribution.

Features	Benefits
No low molecular weight fractions	- promotes flow and leveling - less tendency to crater - improved performance at same average molecular weight - reduced oven volatiles: less oven smoking - less thermal sagging
No high molecular weight fractions	- lower viscosity at same average molecular weight - promotes flow and leveling

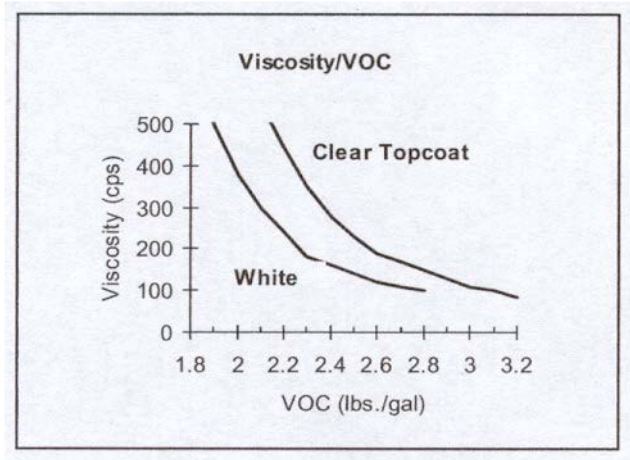
Modifying with Joncryl® 500 to Improve Application Properties

Joncryl® 500 is compatible with a variety of acrylics, alkyds, and polyester resins. These systems are often prone to application problems including cratering, picture framing, telegraphing, thermal sagging, oven smoking, etc. The addition of Joncryl® 500 to these systems can significantly reduce or eliminate these defects. In addition, modification of low molecular weight polyesters and alkyds with Joncryl® 500 can improve hardness, chemical and stain resistance, and durability, as well as reduce over bake yellowing and package stability problems. Normally 20% to 50% of Joncryl® 500 is required to realize a significant benefit. The following diagram serves as a guide for modifying with Joncryl® 500.



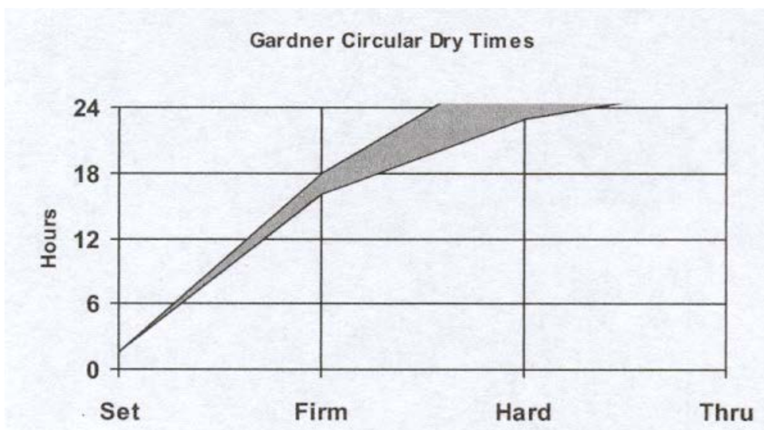
Viscosity/VOC Capability

The viscosity/VOC that Joncryl® 500 formulations are able to achieve is a function of the formulation parameters and the solvents used. The following graph demonstrates the viscosity/VOC capability of Joncryl® 500 in both clear and 17% PVC white topcoat formulations. Methyl n-amyl ketone (MAK) is used as the sole solvent in both formulations.



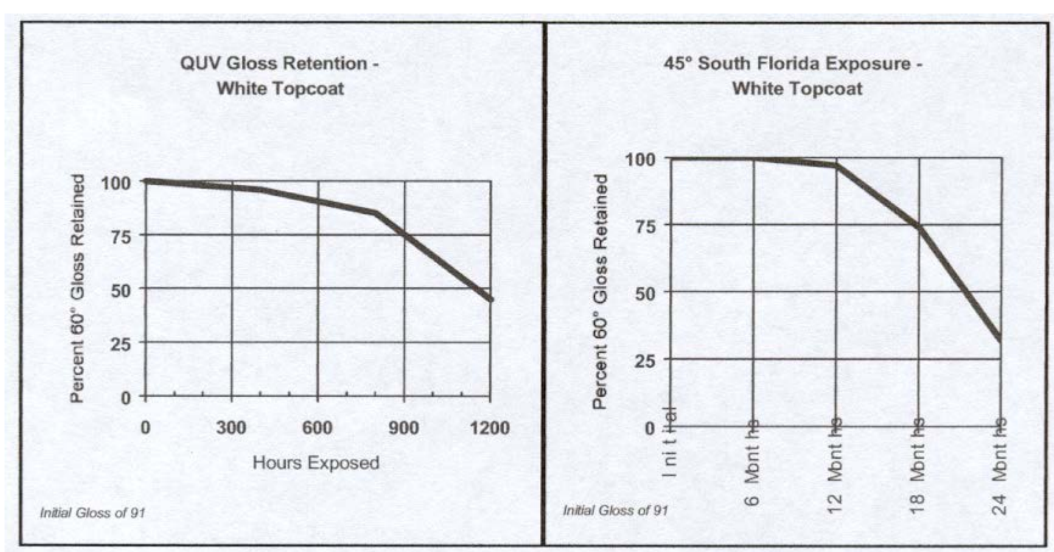
Dry Characteristics

Joncryl® 500 is a low molecular weight, low Tg polyol that depends upon crosslinking to develop dry characteristics. The following graph illustrates the dry time/cure rate of a white topcoat formulation based on Joncryl® 500. This formulation utilizes a NCO:OH ratio of 1:1 and 0.005% dibutyltin dilaurate (DBTDL) on resin solids. The pot life of this system will normally be between 4 and 6 hours when pot life is defined as the time to double initial viscosity. If increased reactivity (faster dry time) is desired, additional DBTDL can be used. As the catalyst level increases, the dry times and the pot life will both be reduced.



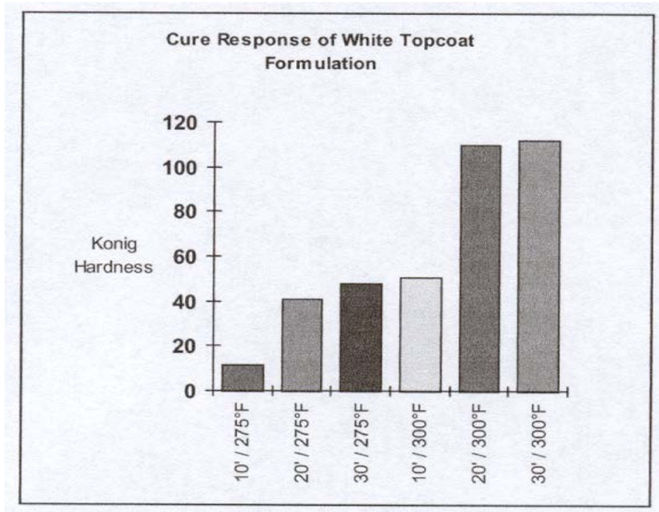
Weathering Properties

QUV gloss retention results were obtained using UVB-313 bulbs with 4 hours of light at 60ºC followed by 4 hours of condensation at 40ºC. Florida Exposure results are 45º South facing exposure. No UV stabilizers were used.



Cure Response

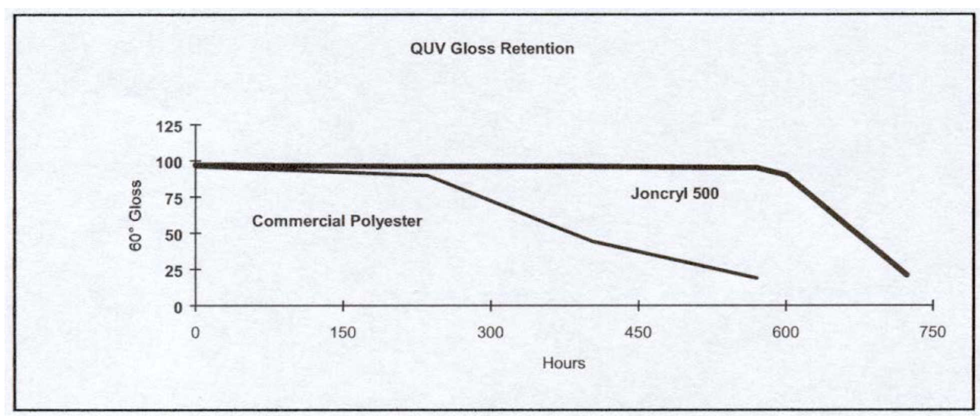
A baking cycle of 20 minutes at 300ºF is normally recommended for a typical Joncryl® 500 melamine formulation when possible. However, it is not always possible to obtain the desired bake temperature. The following graph illustrates König hardness development as a function of bake cycle. This information was generated using a BYK-Chemie Gradient Oven.



The Cure Response of Joncryl® 500-based systems can be improved for marginal situations by increasing the catalyst or by utilizing faster crosslinkers.

QUV Gloss Retention Comparison

The QUV gloss retention of a Joncryl® 500 white topcoat formulation is compared to a commercial polyester in the following graph:



QUV gloss retention results were obtained using UVB-313 on a 4-hour cycle with light at 60ºC and condensation at 40ºC. The formulations utilize Luwipal® 066 LF at a 70:30 polyol:melamine ratio at a pigment:binder ratio of 0.7. Coatings were baked at 300ºF for 20 minutes. No UV stabilizers were used.

Formulation Guidelines

Crosslinker Selection - For maximum gloss retention properties, aliphatic isocyanates are recommended. The Trimer or Biuret versions of hexamethylene diisocyanate can be used. The Trimer version may give better gloss retention and reactivity. A ratio of 1.05:1 of isocyanate to hydroxyl is normally recommended in the industry. However, a ratio of 1:1 of isocyanate to hydroxyl is more economical and does not sacrifice performance properties.

Acrylic-to-Melamine Ratio - For most applications, a standard hexamethoxy methyl melamine resin is satisfactory. A variety of melamines, urea-formaldehydes, benzo-guanamines, and other specialty resins are available for special requirements and applicators. Because of steric hindrance associated with the bulky melamine molecule, it is necessary to determine the optimum acrylic-to-melamine ratio experimentally. A ratio of 70:30 acrylic to melamine by solid weight has been found to provide good overall performance in most applicators and should be considered as a starting point. Ladder studies are generally run in the acrylic-to-melamine range of 55:45 to 85:15.

Solvent Selection - Because the hydroxyl functionality of alcohols and glycol ethers can react with isocyanates, their use should be avoided. Urethane-grade solvents should be used when available. Ketone solvents will give the best viscosity/VOC due to a combination of good solvency and low density. Esters generally provide the next best viscosity/VOC, but do not provide as low of a viscosity/VOC as the ketones due to their higher density. Generally, the lower the molecular weight of the solvent within the family, the lower the viscosity/VOC that is obtainable. Aromatics such as xylene and toluene provide good solvency and can be readily used in combination with the more polar solvents. Glycol ether acetates can be used but normally do not provide as low viscosity/VOC. PM-Acetate exhibits film retention characteristics. Because the melamine molecule has a tendency to self-condense, primary alcohols should be included in the formulation. n-Butanol levels of 25% to 50% of the total available solvent are normally recommended.

Catalysis - Catalysis with 0.005% dibutyltin dilaurate on total binder solids is normally recommended for urethane formulations. Cure speed can be accelerated by increasing the catalyst. However, higher catalyst levels will result in shorter pot life. Other catalysts such as zinc octoate and other metallic soaps can also be used. The addition of 0.5% of a pTSA catalyst on total resin solids is normally recommended for melamine systems. Higher catalyst levels can be employed to speed the cure response, but it would be advisable to also evaluate amino resins with higher imino content such as Luwipal® 072. In addition, a variety of acid catalysts designed to address specific problems such as package stability, moisture resistance, etc. are available from various suppliers.

Additives - BYK[1]-320 is recommended at 2 pounds per 100 gallons of combined formulation. BYK[1]-320 results in excellent flow and leveling as well as providing air release during manufacture and application. If a dispersant is necessary, Lecithin or Disparlon[2] KS-273N is recommended. For higher film build, thixatropes such as bentonite clays, fumed silicas, or organic additives such as Thixatrol[3] can be used. Dow Corning[4] 57 reduced to 10% solids in an appropriate solvent is recommended for improving flow and leveling in melamine systems. For higher film build or control of sagging, thixatropes such as bentonite clays, flumed silicas, or organic additives such as Thixatrol[3] can be used.

Use as a Modifier - Joncryl® 500 polyol is often used as a modifier to upgrade the performance of low molecular weight polyesters and acrylic polyols. Significant improvements in application properties such as flow and leveling, resistance to cratering and telegraphing, and reduction of oven volatiles and thermal sagging can be achieved. Typical use levels range from 20% to 50% or higher of polyol solids.

Starting Point Formulation

The following starting point formulations are recommended for initial evaluations of Joncryl® 500. Additional optimization of the formulations will be required to achieve desired results for specific applications.

Joncryl® 500 GLOSS CLEAR TOPCOAT, Formula 32002-4A

Part A	**Pounds**	**Gallons**
Joncryl® 500	468.50	54.50
Irgaflow® 110	0.80	0.098
MAK	171.10	25.16
DBTDL (1% in MAK)	5.00	5.00
Subtotal	546.40	84.76
Part B		
Basonat® HI 100	194.60	19.94
Total	**840.00**	**104.70**

Formulation Attributes for Formula 32002-4A

Solids	67.2% by wt, 60.1% by volume
Viscosity (Brookfield)	115 – 130 cps
NCO:OH ratio	1.05:1.0
Catalyst level, DBTDL on TRS	0.005%
VOC (calculated)	325 g/l, 2.8 lbs/gal

[1]Registered trademark of BYK-Chemie GmbH.
[2]Registered trademark of King Industries, Inc.
[3]Registered trademark of Elementis Specialties, Inc.
[4]Registered trademark of Dow Corning Corporation.

Safety

General

The usual safety precautions when handling chemicals must be observed. These include the measures described in Federal, State, and Local health and safety regulations, thorough ventilation of the workplace, good skin care, and wearing of personal protective equipment.

Safety Data Sheet

All safety information is provided in the Safety Data Sheet for Joncryl® 500.

Important

While the descriptions, designs, data and information contained herein are presented in good faith and believed to be accurate, they are provided for guidance only. Because many factors may affect processing or application/use, BASF recommends that the reader make tests to determine the suitability of a product for a particular purpose prior to use. **NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING PRODUCTS DESCRIBED OR DESIGNS, DATA OR INFORMATION SET FORTH, OR THAT THE PRODUCTS, DESCRIPTIONS, DESIGNS, DATA OR INFORMATION MAY BE USED WITHOUT INFRINGING THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS.** In no case shall the descriptions, information, data or designs provided be considered a part of BASF's terms and conditions of sale. Further, the descriptions, designs, data, and information furnished by BASF hereunder are given gratis and BASF assumes no obligation or liability for the descriptions, designs, data or information given or results obtained all such being given and accepted at the reader's risk.

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