

**PRIMAL™ CL-3371 Acrylic Polymer**

For Interior Varnishes

**Regional Product Availability**

EMEA

**Description**

PRIMAL™ CL-3371 Acrylic Polymer is a pure acrylic emulsion polymer designed for low solvent content aqueous interior varnishes. PRIMAL™ CL-3371 Acrylic Polymer uses ambient temperature cross-linking technology to offer improved resistance properties versus conventional polymers. It can be used in both Decorative and Industrial applications.

PRIMAL™ CL-3371 Acrylic Polymer can be formulated in gloss to matt wood varnishes for furniture, trim, and parquet lacquers applications. Unlike traditional emulsions which show a white, milky appearance at application, its composition offers a wet appearance close to solvent based systems. Once dried the excellent dry film clarity provided by PRIMAL™ CL-3371 Acrylic Polymer enhances the beauty of the wood.

**Characteristics of the Product**

Varnishes based on PRIMAL™ CL-3371 Acrylic Polymer offer:

- Very good wet and dry film appearance
- No wood discoloration
- Very good block resistance
- Excellent resistance to household chemicals
- Excellent chemical resistance (Möbelfakta certification)
- Excellent wear resistance
- Good sandability

**Typical Physical Properties**

(The properties are typical but do not constitute specifications)

Property	Typical Values
Appearance	Light amber liquid
Solids Content, %	~44.5
pH	~8.7
Viscosity	900 mPa.s max.
Minimum Film Formation Temperature	25–30°C
Specific gravity (dry polymer)	1.14 g/cm <sup>3</sup>
Specific gravity (wet polymer)	1.06 g/cm <sup>3</sup>

## **Formulation Guidelines**

### **Starting Point Formulation**

#### **Ambient temperature cross-linking technology**

PRIMAL™ CL-3371 Acrylic Polymer uses ambient temperature self cross-linking chemistry in a one-pack system. Varnishes formulated with PRIMAL™ CL-3371 Acrylic Polymer will oxidatively cure during and after the coalescing of latex particles to form a cross-linked film with improved resistance properties. They will develop good early properties and will continue to improve during the curing process. It is estimated that the full potential cross-linking takes place within the first four weeks and does not proceed further.

Formaldehyde or aldehyde releasing additives will adversely affect the performance of products based on PRIMAL™ CL-3371 Acrylic Polymer and should be avoided.

#### **Coalescing agent**

For decorative application: A water immiscible coalescent like UCAR™ Filmer IBT at 11–12% on binder solids is suggested to ensure good film formation and excellent resistance properties. A 31% solids formulation, coalesced at that level, results in a ready to use 40g/L VOC.

PRIMAL™ CL-3371 Acrylic Polymer can be formulated with UCAR™ Filmer IBT (or Texanol) alone or blended with more volatile solvents, e.g. Propylene Glycol n-Propylether. The use of volatile solvents, although improving rate of drying, requires higher levels than slow evaporating ones to achieve ultimate film properties. Propylene glycol used at a maximum of 3% on total formulation helps application characteristics.

#### **For Industrial application:**

It is recommended to formulate PRIMAL™ CL-3371 Acrylic Polymer with 14 to 17% coalescing agents based on binder solids. In industrial drying conditions, e.g. 1 to 2 minutes flash off followed by 5–7 minutes at 60°C, a 1:2 blend ratio of UCAR™ Filmer IBT and Propylene Glycol n-Propylether was found to be very efficient to allow a rapid film drying; a good sanding, good stacking, and give excellent dry film performance. To ensure optimum film formation the coalescent package should contain a minimum of 30% UCAR™ Filmer IBT.

#### **Thickener system**

ACRYSOL™ RM-5000 and ACRYSOL™ RM-8W Thickeners were found to be the most suitable rheology modifiers to achieve the best balance of application properties and ultimate dry film performance. The use of 0.2–1.0% on total formulation leads to a 300 cPs viscosity range.

#### **Flatting agents**

Semi-gloss to matt formulations can be achieved by the addition of flatting agents such as Ultralube D.865 or D.815, or Aquamat 263. Depending on the required gloss level, added quantities range from 1–4% on total formulation.

#### **Defoamer**

Byk-024 and TEGO-825 offer acceptable defoaming properties.

#### **Surface additives**

The addition of additive or wax emulsions such as Tegoglide 482 or Ultralube E-359 contributes to improve mar, slip and scratch resistance of the dry film. Ultralube E-846 was found to help "Taber" abrasion resistance. Wetting of wood surfaces can be improved by the addition of Tegowet 265.

**PRIMAL™ CL-3371 Acrylic Polymer in Decorative Applications**  
**Interior gloss varnish based on PRIMAL™ CL-3371 Acrylic Polymer Formulation**  
**EC-3371/3 Ingredients**

Ingredients	Kilograms
PRIMAL™ CL-3371 (44.5%)	70.0
Byk 024	0.4
Water	10.5
UCAR™ Filmer IBT	3.6
Ultralube E-846	6.0
ACRYSOL™ RM-8W	0.2
Water	9.3
<b>Total</b>	<b>100.0</b>
Weight solids %	31.1
pH	8.5
60° Gloss on wood	70%

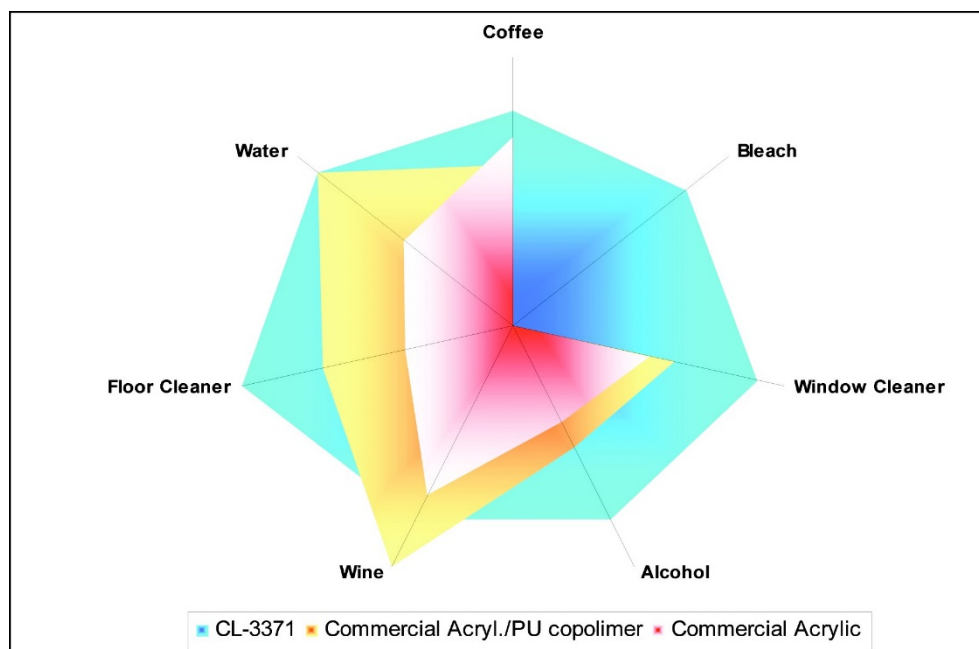
**Chemical Resistance**

The table below describes the resistance properties of PRIMAL™ CL-3371 Acrylic Polymer exposed to various household products for one and 16 hours.

	PRIMAL™ CL-3371		PRIMAL™ CL-3371	
	1 hour contact		16 hours contact	
	Ash	Mahogany	Ash	Mahogany
Coffee	10	9	8	7
Bleach (5%)	10	10	8	9
Window cleaner	10	10	9	7
Alcohol (1/1 H <sub>2</sub> O)	8	7	8	5
Red wine	10	10	8	9
Floor cleaner	10	10	10	9
Water	8	8	9	8

Rating done immediately after stain removal. Rating 0 to 10, 10 is best.

The following graph shows the resistance profile to the selected household products of a PRIMAL™ CL-3371 Acrylic Polymer based clear formulation and two commercial water based lacquers.



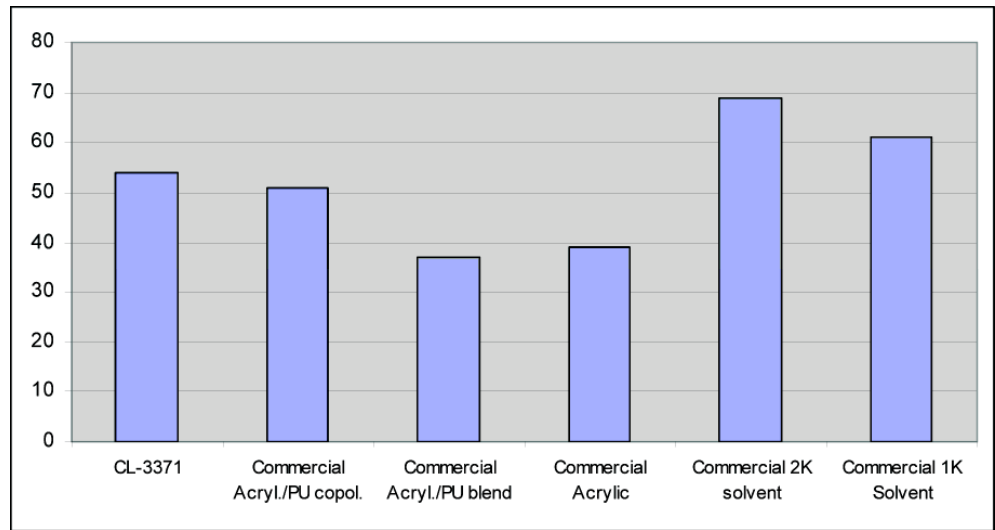
#### Testing procedure:

Three coats of the tested varnishes were brush applied over two types of wood. The first and second coats were applied within the same day, with light sanding of the first one before recoat, the third one after overnight drying. After one week drying at room temperature the selected household products were applied on the varnishes surface.

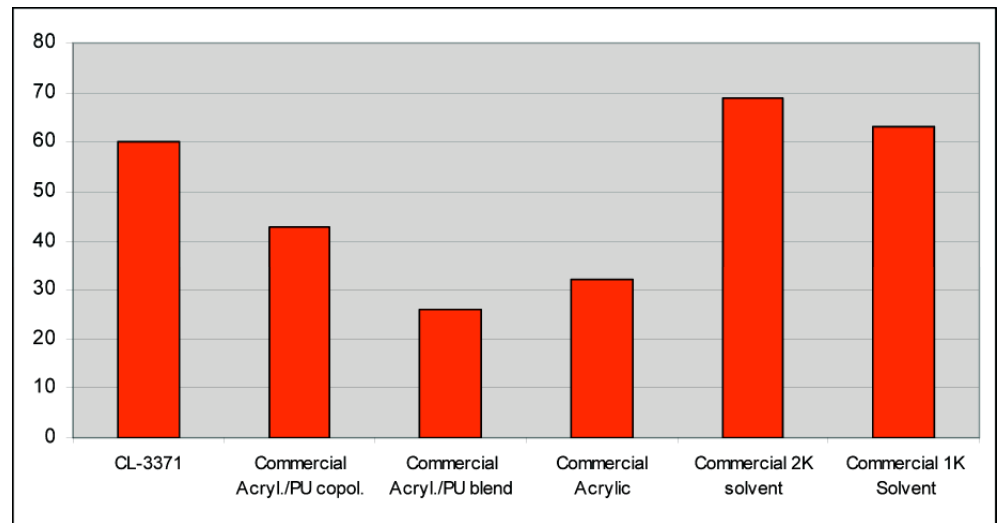
After the selected contact time, the liquids were removed using a dry paper tissue. A visual assessment of the potential damage to the clear surface was done right after removal of the stains.

The cumulative rating results of resistance properties of PRIMAL™ CL-3371 Acrylic Polymer and several commercial solvent and water based products are shown in the two graphs below.

**Stain resistance over Mahogany (16 hours contact)**

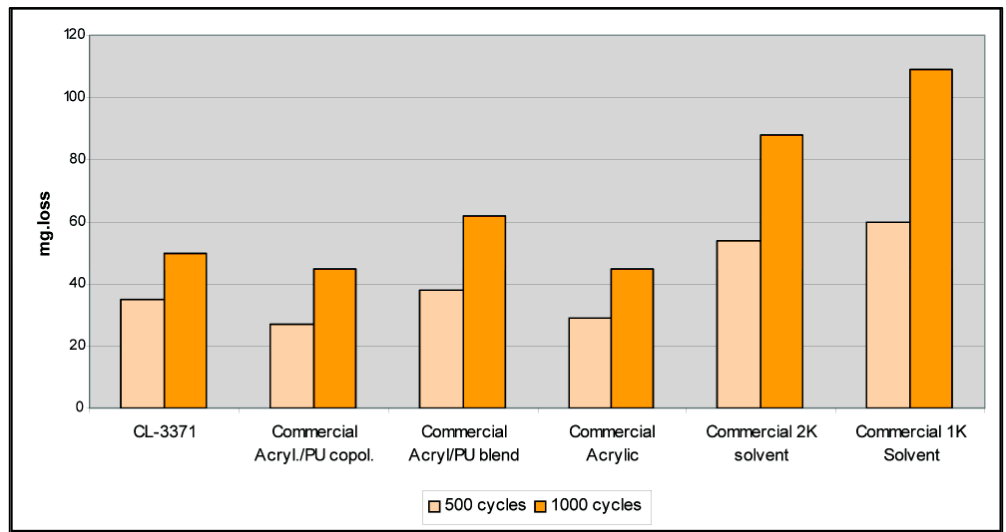


**Stain resistance over Ash (16 hours contact)**



### “Taber” Abrasion Resistance

The following graph shows the weight loss of a PRIMAL™ CL-3371 Acrylic Polymer based formulation and several water based and solvent based commercial products after 500 and 1000 abrasion cycles.



### Testing procedure:

Three coats of the tested varnishes were brush applied over wood panels. The first and second coats were applied within the same day, with light sanding of the first one before recoat, the third one after overnight drying. After three weeks drying at room temperature, varnishes were submitted to 500 and 1000 cycles on a Taber abraser (CS-10 wheels; 1000 gr.). Weight loss was measured after each set of cycles.

## **PRIMAL™ CL-3371 Acrylic Polymer in Industrial Applications**

Gloss clear varnish for furniture based on PRIMAL™ CL-3371 Acrylic Polymer

Formulation LM-3371/1

Ingredients	Kilograms
PRIMAL™ CL-3371 Acrylic Polymer (44.5%)	75.6
<b>Add as a premix</b>	
Propylene Glycol n-Propylether (PnP)	4.1
UCAR™ Filmer IBT	1.7
Water	15.1
Ultralube E-359	2.2
ACRYSOL™ RM-5000	1.0
<b>Total</b>	<b>100.0</b>
Weight solids %	35
pH	8.5
60° Gloss on wood, %	70
F.C. n° 4 viscosity (seconds)	25–30

Satin clear varnish for furniture based on PRIMAL™ CL-3371 Acrylic Polymer

Formulation LM-3371/2

Ingredients	Kilograms
PRIMAL™ CL-3371 Acrylic Polymer (44.5%)	79.0
<b>Add as a premix</b>	
Propylene Glycol n-Propylether (PnP)	3.6
UCAR™ Filmer IBT	2.0
Water	8.5
Tegofomex 825	0.7
Tegoglide 482	0.3
AMP-90™	0.3
Ultralube D-865	4.3
ACRYSOL™ RM-8W	0.2
Water	1.1
<b>Total</b>	<b>100.0</b>
Weight solids %	38
pH	8.5
60° Gloss on wood, %	35
F.C. n° 4 viscosity (seconds)	25–30

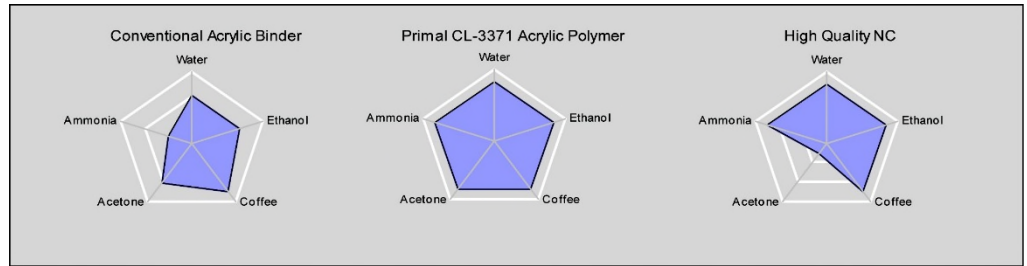
“Möbelfakta” test results (results from accredited Nordic Laboratory)

Chemicals/ Norms		Clear varnish based on PRIMAL™ CL-3371 Acrylic Polymer LM 3371/2
Liquid paraffin	24 hours	5
Coffee	1 hour	5
Ethanol	1 hour	5
Resistance to fat on surfaces with scratches (7N)	24 hours	5
Resistance to dry heat		1
Water	24 hours	5
Water	16 hours	5

Results show that the clear varnish formulation based on PRIMAL™ CL-3371 Acrylic Polymer

could be used for table tops, storage furniture, kitchen and bathroom units (outside and shelves)

**This graph shows the chemical stain resistance properties of PRIMAL™ CL-3371 Acrylic Polymer compared to conventional acrylic binder and high quality nitrocellulose technology**





<b>Handling Precautions</b>	Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.
<b>Storage</b>	Store products in tightly closed original containers at temperatures recommended on the product label.
<b>Disposal Considerations</b>	<p>Dispose in accordance with all local and national regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.</p> <p>It is the user's responsibility to verify that treatment and disposal procedures comply with local and national regulations. Contact your Dow Coating Materials Technical Representative for more information.</p>
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