Technical Presentation Summary

Development of Novel Self-Crosslinking Resins for Waterborne Wood Finishes

Venue
The American Coatings Show, Indianapolis, IN
Date
May 9, 2012
Presenter
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Summary
Solvent-borne chemistries dominate wood coatings technologies used in the manufacture of furniture and kitchen cabinets in North America. While reformulation has enabled lower VOC and HAPS levels associated with these solvent-borne technologies, there is regulatory and consumer-driven interest in going even lower through the use of waterborne acrylic resins. A waterborne acrylic resin developed by Dow Coating Materials employs a novel ambient self cross-linking mechanism that facilitates faster property development and helps eliminate yellowing when applied over formaldehyde emitting substrates or basecoats. When used as a sole binder or in combination with a novel polyurethane dispersion in clear and pigmented sealers and topcoats, the novel self cross-linking acrylic helps demonstrate rapid property development, excellent appearance, and excellent block, print and chemical resistance.

Details

Coating ID	WB-1	WB-2	WB-3	WB-4	WB-5
Description	Thermoplastic WB Acrylic	Thermoplastic WB Acrylic	Self-Crosslinking WB Acrylic (oxidative cure)	Novel Self-Crosslinking WB Acrylic (non-oxidative cure)	Acrylic/PUD Blend (based on novel self-crosslinking WB acrylic)
Sealer	X		X	X	X
Topcoat		X	X	X	X
Polymer Properties					
MFFT (°C)	40	17	43	42.5	<0
Coating Properites					
VOC (g/L)	275	252	209	209	146

Chemical Resistance - Furniture

Fig.1. Systems based on novel self-crosslinking acrylic resin (non-oxidative) demonstrate good chemical resistance compared to other water-based systems.

Chemical Resistance vs. Cure Time

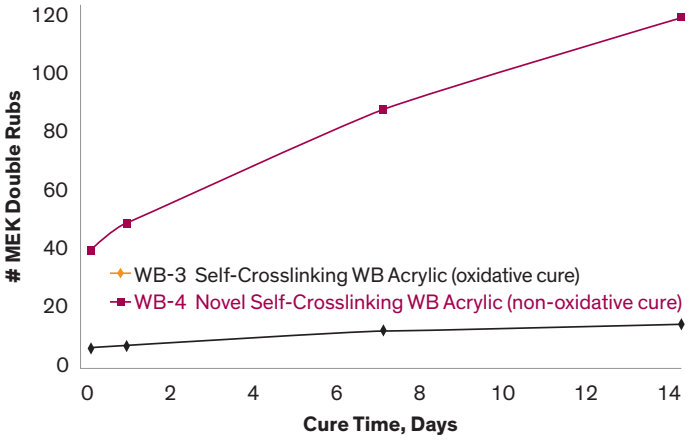

Fig.2. Novel self-cross linking resin allows for faster development of chemical resistance.

Hardness Development

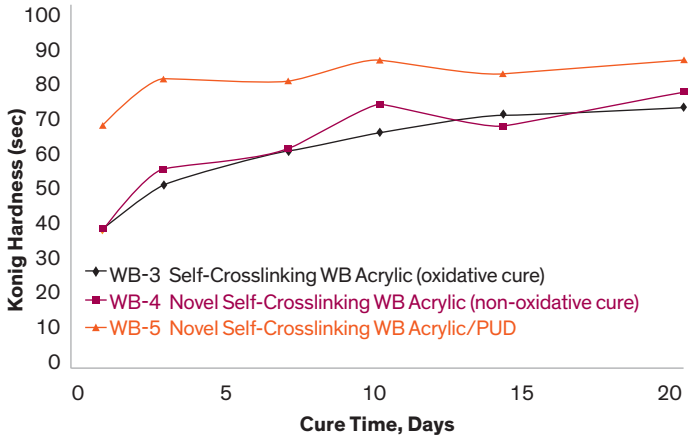

Fig.3. Hardness development of novel self cross-linking resin is similar to current self cross-linking resin. When combined with PUD, the hardness develops even faster.

Mandrel Bend Flexibility

Coating (topcoat)	WB-2	WB-3	WB-4	WB-5	WB-7	SB-3	SB-4	SB-5
Description	Thermoplastic WB Acrylic	Self-Crosslinking WB Acrylic (oxidative cure)	**Novel Self-Crosslinking WB Acrylic (non-oxidative cure)**	**Novel Self-Crosslinking WB Acrylic/ PUD**	Commercial WB Acrylic Lacquer	Commercial SB NCL Lacquer	Commercial SB Catalyzed Lacquer (catalyzed)	Commercial SB CAB/ Acrylic Lacquer
Pass Diameter	1/8"	3/4"	**1/4"**	**1/8"**	3/8"	1/4"	1/4"	>1"

Although similar in hardness, novel self-crosslinking acrylic technology has better flexibility than oxidative curing acrylics.

Color Development Over Substrates That Release Formaldehyde

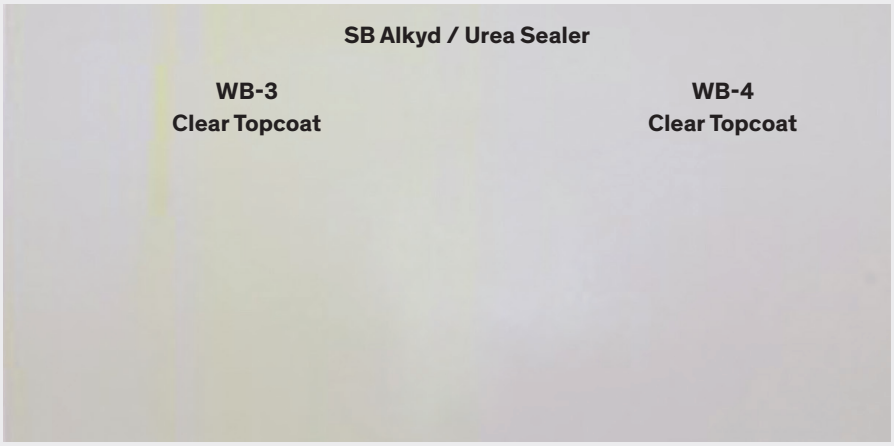

Fig.4. When applied over a solvent-borne alkyd/urea conversion varnish sealer that releases formaldehyde, novel self-crosslinking acrylic technology (right) does not yellow when in contact with formaldehyde.

Conclusions

Novel self-crosslinking acrylic technology developed by Dow Coating Materials offers the wood finishing industry a one-component, low VOC, and high performance alternative to traditional solvent-borne systems. Features and benefits offered by this technology include fast development of properties, excellent hardness, block and print resistance, no interaction with formaldehyde released from the substrate or another coating layer which can cause yellowing, and (when combined with a novel PUD) accelerated film formation.

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