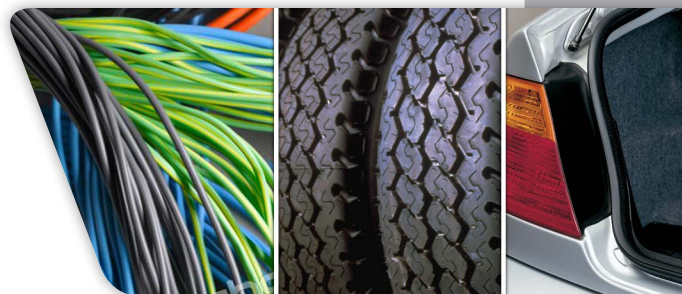


Ricobond® 5112 and Ricobond® 5122: New Additives That Enable Hot Melt Adhesives to be Removed With Caustic



Benefits

- Impart caustic solubility/removability
- No impact upon adhesive performance

Target Markets

- Caustic-soluble polymers
- Bottle label adhesives

Additional Information

MSDS: Ricobond® 5112, Ricobond® 5122

TDS: Ricobond® 5112, Ricobond® 5122

“Formulating With Ricobond® 5112 & 5122 in HMPSA for Imparting Caustic Removability”

Description

Conventional styrenic block copolymer-based hot melt pressure sensitive adhesives (SBC HMPSA) are known for their excellent tack and adhesion to a wide variety of materials. Another well-known characteristic of these adhesives is their ability to resist water and aqueous solutions of acid and base. A new set of additives has been developed that imparts caustic solubility to these adhesives with minimal impact on the performance of the adhesive.

Current caustic removable adhesive technology utilizes water-based acrylic polymers that have less aggressive adhesion and tack resulting in a label with poorer performance than those with hot melt adhesive technology.

Cray Valley has developed a new additive technology that allows adhesive formulators to make HMPSAs that are caustic soluble without sacrificing the performance of the adhesive. The technology consists of two materials, described in Table 1, that are easily added into the adhesive during the typical mixing process.

TECHNICAL UPDATE

Ricobond® 5112 and Ricobond® 5122: New Additives That Enable Hot Melt Adhesives to be Removed With Caustic



Table 1: Additives

Product	Description	Function
Ricobond 5112	Premium acid-functional aliphatic polymer 100% active Viscous liquid (450 Pa.s @ 25 °C)	Aids in dispersing the aliphatic portion of the adhesive
Ricobond 5122	Acid-functional aromatic polymer 100% active Viscous liquid (110 Pa.s @ 25 °C)	Aids in dispersing the aromatic portion of the adhesive

To demonstrate the ability of these additives to impart caustic solubility, and therefore removability, to a HMPSA, we evaluated the performance in a typical label adhesive formulation as seen in Table 2.

The additive package required for caustic solubility of a SBC HMPSA has been reduced by 20% with this latest development. It now consists of a mixture of Ricobond 5122, for solubilization of the aromatic portion of the adhesive, in combination with Ricobond 5112 at a 1:1 mixture added at only 8 parts total per 100 parts of adhesive. The formulator may choose other combinations ranging from 3:1 to 1:3 depending upon the desires of the individual HMPSA formulator and the starting point formulation chosen. For example, higher styrene SBCs may require proportionally more Ricobond 5122.

All adhesive performance testing was completed using 2-mil PET film coated with 0.9 mil of adhesive on a ChemInstruments hot melt coater/laminator.

Table 2: Model Adhesive Formulation

Component	Description	Amount, parts	Weight % Total
Kraton® D1113 ¹	Linear SIS block polymer	100	38.3
Ethanox® 310 ²	Antioxidant	2	0.8
Wingtack® ET ³	Tackifying resin	120	45.9
Nyflex® 222B ⁴	Naphthenic process oil	20	7.7
	Sub-total	242	92.7
Ricobond 5122	Aromatic additive	9.6	3.65
Ricobond 5112	Premium aliphatic additive	9.6	3.65
	Total	261.2	100

¹Kraton is a trademark of Kraton Performance Polymers, Inc.

²Ethanox is a trademark of Albemarle Corp.

³Wingtack is a trademark of Total Cray Valley

⁴Nyflex is a trademark of Nynas AB

TECHNICAL UPDATE

Ricobond® 5112 and Ricobond® 5122: New Additives That Enable Hot Melt Adhesives to be Removed With Caustic

Note that the aged samples are materials that were tested after accelerated aging in a forced-air oven for seven days at 70 °C, which is commonly believed to simulate a one-year shelf life. Any differences exhibited in the data can generally be attributed to normal “noise” due to coating and testing of these materials in a laboratory setting.

Caustic Solubility and Removability

Caustic solubility was determined and rated on a 0 to 5 scale where a rating of 0 indicates that the caustic had absolutely no effect upon the adhesive specimen. A rating of 5 indicates that the adhesive and test specimen were completely removed within the five minute time limit with no visible adhesive residue of any kind on the glass panel, including no visible “stickies” in the caustic solution.

The caustic solubility was determined on adhesive samples 15 minutes after application to glass panels and on another set of samples where the adhesive specimens were allowed to build adhesion for 24 hours before immersion in the caustic solution. The results shown here are the results for the samples allowed to dwell on the glass for 24 hours. These results demonstrate the effectiveness of just 8 parts of additive per 100 parts of adhesive at imparting caustic solubility and label removability.

The photo in Figure 1 shows a paper label quickly coming loose in the caustic solution less than one minute after immersion.



Figure 1: Photo of brown paper strips quickly coming off a glass plate in less than one minute after immersion into an 80 °C caustic solution.

Figure 2:
Peel Adhesion Off Glass

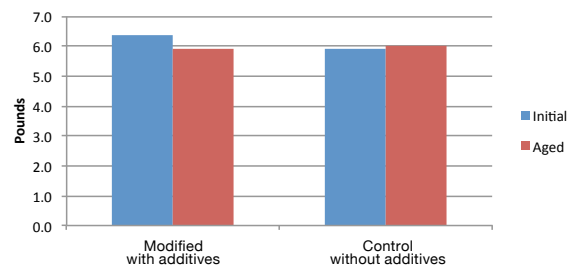
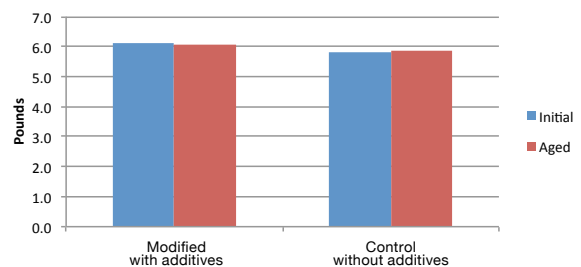


Figure 3:
Peel Adhesion Off SS



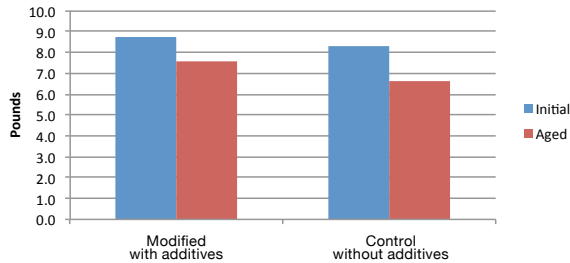
TECHNICAL UPDATE

Ricobond® 5112 and Ricobond® 5122: New Additives That Enable Hot Melt Adhesives to be Removed With Caustic

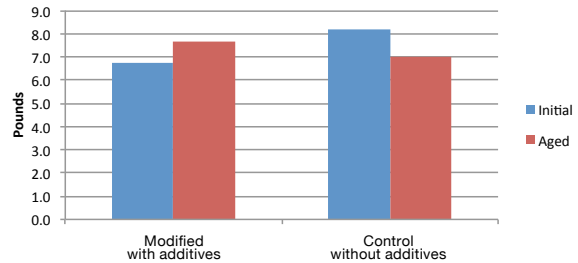
CRAY VALLEY

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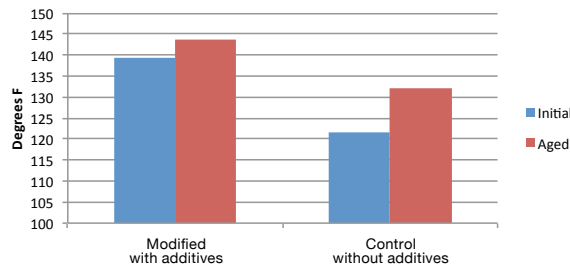
**Figure 4:
Loop Tack Off Glass**



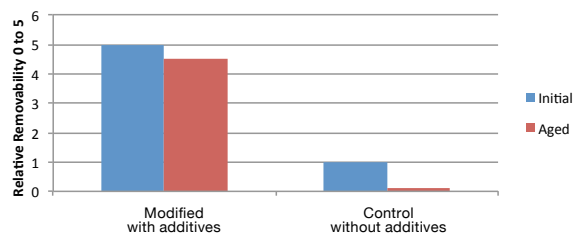
**Figure 5:
Loop Tack Off SS**



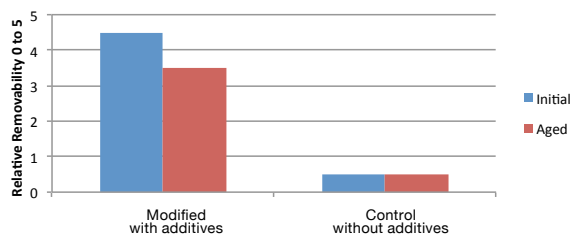
**Figure 6:
Shear Adhesion Failure Temperature (SS)**



**Figure 7:
Caustic Removability Rating
Paper From Glass**



**Figure 8:
Caustic Removability Rating
PET From Glass**



Summary

The newly enhanced Ricobond additives from Cray Valley induce caustic solubility in styrenic block copolymer-based hot melt pressure sensitive adhesives without significantly impacting the highly desirable peel adhesion and tack that hot melt adhesives are known for. The additives have the side benefit of increasing the SAFT of the adhesive approximately 15 °F.

TECHNICAL UPDATE

Ricobond® 5112 and Ricobond® 5122: New Additives That Enable Hot Melt Adhesives to be Removed With Caustic



Appendix

Table 3: Test Methods

Test Description	Test Method Standard
Peel Adhesion	PSTC-101 180° Peel Adhesion
Shear Adhesion Failure Temperature (SAFT)	PSTC
Loop Tack	PSTC

Caustic Solubility and Removability

- 1" strips on glass
- 15 minutes and 24 hours on glass
- 5-minute maximum immersion time
- 80 °C using 2.5% NaOH
- Mild agitation (no vortex)

About Total Cray Valley

Total Cray Valley is the premier global supplier of specialty chemical additives, hydrocarbon specialty chemicals, and liquid and powder tackifying resins used as ingredients in adhesives, rubbers, polymers, coatings and other materials. Total Cray Valley has pioneered the development of these advanced technologies, introducing hundreds of products that enhance the performance of products in energy, printing, packaging, construction, tire manufacture, electronics and other demanding applications.

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