

Blending Coagents Improves Rubber Performance



Benefits

- Provides rubber adhesion while optimizing compression set
- Improves tear properties at high modulus
- Maintains ultra-high hardness, while minimizing migration/blooming of coagent
- Improves flexural fatigue properties
- Provides moderate scorch safety while maintaining modulus

Additional Information

MSDS/TDS: SR522, Dymalink[®] 633, Dymalink[®] 634

Description

Multifunctional coagents are used to improve the cure kinetics and ultimate physical properties of elastomers cured with organic peroxides. A wide variety of coagents are available from Resin Solutions, each having unique structure-property relationships. Coagents are typically selected to impart specific performance attributes to the compound. However, improvements in certain physical properties may come at the expense of others, and it is not uncommon for physical property specifications to be gained at the expense of processing requirements. By blending certain classes of coagents, it may be possible to optimize physical properties that would be mutually exclusive if working only with a single coagent. In addition, coagent blends may allow for improvements in both physical properties and processing.

Certain classes of coagents can best improve physical properties through blending. It can be advantageous to blend certain Type I coagent products. Examples provided below will demonstrate how metallic and liquid (meth) acrylate esters can be blended to optimize certain physical properties. In the case of blending Type I coagents, it is important to note that mixing acrylate and methacrylate esters is not desirable; when blending Type I coagents, the best results are provided through either acrylate-acrylate or methacrylate-methacrylate pairs. As a rule, Type I and Type II coagents can be blended to take advantage of the different cure kinetics and compound solubility inherent to each class. Often the technology yields results that can be accurately predicted based on the coagent blend ratio.

Suggested Applications

- High-hardness compounds (e.g., rubber rolls, engineered products)
- Adhesion to metal or reinforcing textiles (e.g., hoses and belts)
- Peroxide-cured compounds demanding high tear or flexural fatigue (e.g., vibration mounts, belts, tires)

TECHNICAL UPDATE

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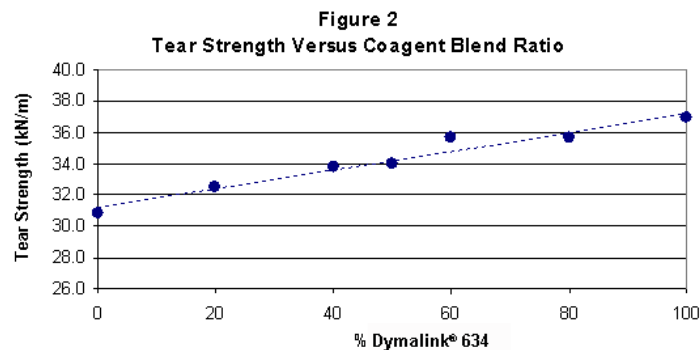
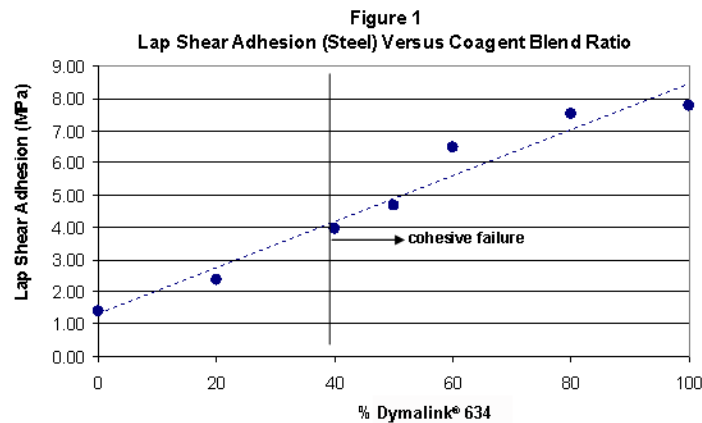
Table 1
Coagent Descriptions

Coagent Type	Type 1	
	Liquid Coagent	Metallic Coagent
Acrylate	SR522	Dymalink® 633
Methacrylate	SR517R	Dymalink® 634

SR517R and SR522 are products of Sartomer USA, LLC, an Arkema company.

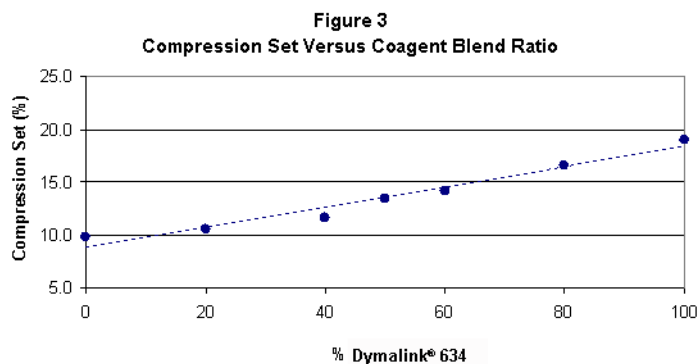
Metallic monomer coagents (Dymalink® 633, Dymalink® 634) are often selected to generate rubber adhesion to polar substrates (metal, textiles) or improve the tear and dynamic properties of the compound. However, due to the unique structure and cure mechanism of these coagents, permanent set under compression is often dramatically increased. By replacing part of the coagent loading with a liquid monomer (SR517R, SR522), adhesion or dynamic properties can be maintained at an acceptable level while improving compression set.

A model EPDM formulation cured with coagents and peroxide (Appendix) was used to demonstrate trends in physical properties across the spectrum of SR517R/Dymalink® 634 blend ratios. Total coagent loading was held constant at 10 phr, which resulted in a 100% modulus of nearly constant value (2.60 +/- 0.7 MPa). Results are shown below as a function of % Dymalink® 634 in the coagent blend. Adhesion was maintained at levels of liquid monomer that provide improved compression set. Tear and flex fatigue were improved with Dymalink® 634 loading while maintaining modulus and hardness. The results indicate that a predictable relationship between coagent blend ratio and physical properties exists. Through judicious selection of blend components and ratio, the specified physical properties of the compound may be optimized.



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While the opportunities for blending Type I coagents are somewhat restricted to metallics and liquid (meth) acrylate esters, blending Type I with Type II coagents offers more possible combinations. Liquid Type I (meth) acrylate esters (e.g., SR517R) are often used at very high loadings (>10 phr) to not only increase the final hardness of the compound, but also to maintain processing characteristics. Unfortunately, most (meth)acrylate ester liquid coagents are only slightly soluble in hydrocarbon rubber and can migrate between components or bloom to the surface prior to cure if loaded at elevated levels.

About Resin Solutions

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

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