Introduction

Resin dispersions are ideal for applications that involve tackification of natural rubber latex for specialty film applications. In particular, resin dispersions prepared from aliphatic hydrocarbon resins have excellent compatibility with natural rubber latex and impart peel strength in small increments relative to resination level.

Examples of specialty film applications include tapes and protective films. For tape applications, high cohesion and a good balance of tack and peel are required. Low cohesive strength, residue-free adhesives are desirable for protective film applications. Eastman Chemical Company offers several aliphatic hydrocarbon dispersions that are ideal for use in specialty film applications which include:

- **Tacolyn™ 5070 resin dispersion**—Tacolyn 5070 is an aqueous, 50% solids, solvent-free, aliphatic hydrocarbon dispersion prepared from a low molecular weight, aliphatic C5 hydrocarbon resin. It is recommended as a tackifier for isoprene rubber and natural rubber latex polymers used in tape applications. Tacolyn 5070 is ideal for low peel applications, as it imparts peel strength in small increments relative to resination level. It exhibits good storage and mechanical stability, and notably outstanding stability to acids.

- **Tacolyn™ 5085 resin dispersion**—Tacolyn 5085 is a 55% solids, solvent-free hydrocarbon resin dispersion prepared from a low molecular weight, aliphatic C5 hydrocarbon resin. It is recommended as a tackifier for isoprene rubber and natural rubber latex polymers used in tape applications. Tacolyn 5085 is a good reinforcing agent that maintains excellent peel strength when used in pressure sensitive tapes.

In this work, pressure sensitive tape and protective film adhesives were prepared consisting of 100 parts tackifier resin and 100 parts natural rubber latex (on a dry weight basis). These adhesives were evaluated for peel, tack, and shear properties.

Technical discussion

As illustrated in Figures 1 and 2, a protective film adhesive formulated with Tacolyn 5070 resulted in good peel and tack performance. It should be noted that the failure mode was adhesive, which is desirable in protective film applications where it is important that no residue is left on the surface the film is protecting. The natural rubber tape formulation with Tacolyn 5085 also resulted in good peel and tack performance.

**Figure 1 180° Peel test results**

![Graph](image1)

**Figure 2 Loop tack test results**

![Graph](image2)

Note: Test laminates consisted of 25 g/m² dry adhesive coated onto Mylar™ (PET) film. 180° peel adhesion was determined in accordance with test method PSTC-1 with a five-minute dwell time. All tests were performed @ 23°C, 50% relative humidity. Test data was reported as an average five specimens.
As shown in Figure 3, shear performance of a natural rubber tape formulation is high when Tacolyn 5085 is added. In contrast, the use of Tacolyn 5070 in a natural rubber latex results in an adhesive with low cohesive strength, a highly desirable property in protective film applications.

**Figure 3 Shear adhesion failure results (SAFT)**

<table>
<thead>
<tr>
<th>Shear (hours)</th>
<th>Stainless steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Tacolyn 5070</td>
</tr>
<tr>
<td>10</td>
<td>Tacolyn 5070</td>
</tr>
<tr>
<td>20</td>
<td>Tacolyn 5070</td>
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<tr>
<td>30</td>
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<td>Tacolyn 5070</td>
</tr>
<tr>
<td>80</td>
<td>Tacolyn 5070</td>
</tr>
</tbody>
</table>

Note: Labels consisted of 25 g/m² dry adhesive coated onto Mylar™ (PET) film. Dimensions for 178° shear test were 1" x 1" contact area with a 1 kg weight. All tests were performed @ 23°C, 50% relative humidity. Test data was reported as an average five specimens.

As illustrated in Figure 4, there is a direct correlation between peel strength and resination level. Figure 4 also demonstrates that peel strength of natural rubber-based adhesives is increased in small increments relative to the resination level. Thus, it is possible to use a single resin dispersion at various loadings to customize pressure sensitive adhesives with a variety of peel performances.

**Figure 4 Peel strength vs. resination level on stainless steel**

Note: Test laminates consisted of 25 g/m² dry adhesive between Mylar™ (PET) film and siliconized release liner. 180° peel adhesion was determined in accordance with test method PSTC-1 with a five-minute dwell time. All tests were performed @ 23°C, 50% relative humidity. Test data was reported as an average five specimens.

**Conclusion**

Eastman offers several aliphatic hydrocarbon resin dispersions ideal for tackification of natural rubber latex in specialty film applications. Aliphatic resin dispersions have excellent compatibility with natural rubber latex and impart peel strength in small increments relative to the resination level. Thus, it is possible to use a single resin dispersion at various loadings to customize pressure sensitive adhesives with a variety of peel performances.

In protective film applications, Tacolyn 5070 is the preferred tackifier. Protective film adhesives based on Tacolyn 5070 and natural rubber latex results in a residue-free adhesive with low cohesion. As a modifier for pressure sensitive tape applications, Tacolyn 5085 offers a good balance of peel and tack coupled with high shear strength.

For more information on formulation strategies using tackifiers from Eastman, contact us at 1-800-EASTMAN or through the internet at www.tackifier.com.
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