Adhesives Market Technical Tip

Tackifying Resins for Use in *INFUSE*™ Olefin Block Copolymers (OBC) (TT-83)

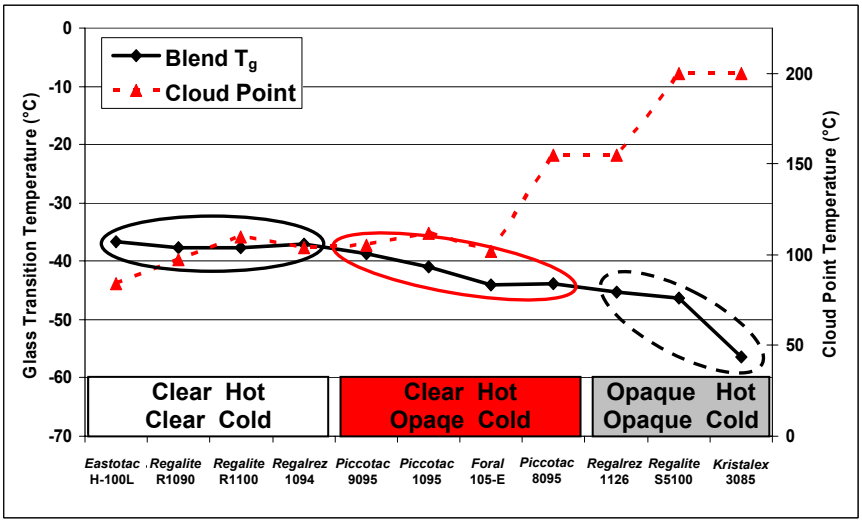
Introduction

The introduction of *INFUSE*™ Olefin Block Copolymers (OBC) by The Dow Chemical Company presents new opportunities for hot melt adhesive formulation. These ethylene and α-olefin copolymers are comprised of alternating blocks of semi-crystalline "hard" and elastomeric "soft" segments arranged in a random multi-block architecture that follows a statistical distribution of block lengths. This unique structure gives OBC, polymers unique tackifier requirements.

To facilitate formulation of these new polymers, their compatibility with various tackifier resin classes has been investigated. Hydrocarbon resins with varying degrees of aromatic and aliphatic character and one rosin-based resin were tested for compatibility with OBC. The hydrocarbon resins tested were: *Regalite* R1090, R1100, and S5100, *Eastotac* H-100L, *Regalrez* 1094 and 1126, *Piccotac* 1095, 9095, and 8095 and *Kristalex* 3085. Also tested was *Foral* 105-E, an ester of hydrogenated rosin.

The lower molecular weight, fully hydrogenated *Eastotac*, *Regalite*, and *Regalrez* tackifier resin families are most compatible with Dow Chemical's new OBC polymers. *Eastotac* H-100L, *Regalite* R1090 and R1100, and *Regalrez* 1094 are preferred resins.

Figure 1: Cloud Point and Tg of 1:1 OBC:Resin Blends



Technical Discussion

Tackifying resins raise the glass transition temperature (Tg) of a compatible polymer. A relatively simple method to estimate the compatibility of two polymers is to measure the Tg of the mixture by Differential Scanning Calorimetry (DSC). When the polymer and tackifier resin are not fully compatible, the measured Tg of the blend is lower than predicted and/or more than one Tg is detected. Alternatively, compatibility can be determined by measuring the full cloud point temperature of the blend. A lower cloud point temperature indicates better compatibility of the blended materials.

Tackifier resins with different degrees of aliphatic and aromatic nature were tested for compatibility by preparing a 1:1 blend with 0.866 g/cc, 20 melt index OBC polymer. All resins were hydrocarbon-based except *Foral* 105-E, which was rosin-based.

The measured Tg and cloud points for resin:OBC blends are shown in Figure 1. The measured Tg was closer to the predicted value as the polar and/or aromatic nature of the tackifier resin decreased. Additionally, OBC's were most compatible with aliphatic tackifiers with molecular weight below 2500 g/mol. This trend in compatibility was also seen when measuring the full cloud point temperature of the 1:1 OBC:tackifier resin blends. Aliphatic tackifier resins with molecular weights below 2500 g/mol produced blends that were clear, when hot and cold, with a cloud point temperature below 100°C, shown below in Figure 2 (left). Aromatic and high molecular weight resins produced opaque blends, see Figure 2 (right).

Figure 2: OBC: *Eastotac* H-100L and OBC:*Kristalex* Blends

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Conclusion

The lower molecular weight, fully hydrogenated *Eastotac*, *Regalite*, and *Regalrez* tackifier resin families are most compatible with one of the new Olefin Block Copolymer (OBC) polymers introduced by The Dow Chemical Company. The hydrogenated hydrocarbon resins *Eastotac* H-100L, *Regalite* R1090 and R1100, and *Regalrez* 1094 are preferred for use with the OBCs tested here.

For more information on formulation strategies using tackifiers from Eastman Chemical Company, contact us at 1-800-EASTMAN or at www.eastman.com/adhesives.

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TT-83

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