

## Adhesives market technical tip

### Tackifying resins for use in Infuse™ olefin block copolymers (OBC)

#### 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  $\alpha$ -olefin copolymers are comprised of alternating blocks of semicrystalline "hard" and elastomeric "soft" segments arranged in a random multiblock architecture that follows a statistical distribution of block lengths. This unique structure gives OBC 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.

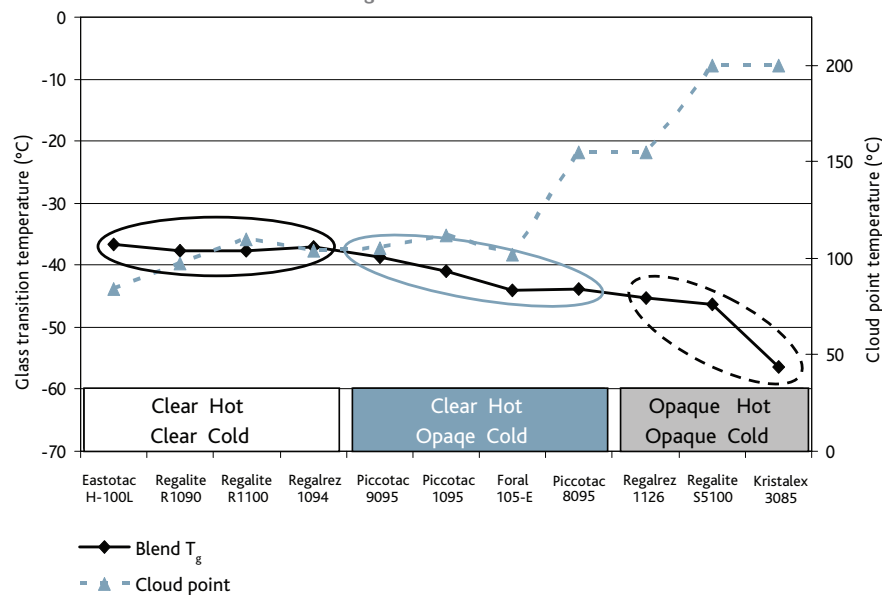
Eastotac H-100L, Regalite R1090 and R1100, and Regalrez 1094 are preferred resins.

#### Technical discussion

Tackifying resins raise the glass transition temperature ( $T_g$ ) of a compatible polymer. A relatively simple method to estimate the compatibility of two polymers is to measure the  $T_g$  of the mixture by Differential Scanning Calorimetry (DSC). When the polymer and tackifier resin are not fully compatible, the measured  $T_g$  of the blend is lower than predicted and/or more than one  $T_g$  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. All resins were hydrocarbon-based except Foral 105-E, which was rosin-based.

Figure 1 Cloud point and  $T_g$  of 1:1 OBC:Kristalex™ blends



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### Tackifying resins for use in Infuse™ olefin block copolymers (OBC) *(Continued)*

The measured  $T_g$  and cloud points for resin:OBC blends are shown in Figure 1. The measured  $T_g$  was closer to the predicted value as the polar and/or aromatic nature of the tackifier resin decreased. Additionally, OBCs 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 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



## Conclusion

The lower molecular weight, fully hydrogenated Eastotac, Regalite, and Regalrez tackifier resin families are most compatible with one of the new Olefin Block Copolymers (OBC) 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 [www.eastman.com/adhesives](http://www.eastman.com/adhesives).



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