Thermoplastic Polyolefin Blends Including Block Composites as Compatibilizers

Field

[0001] Embodiments relate to thermoplastic polyolefin blends that include a block composite (BC) compatibilizer.

Introduction

[0002] Soft thermoplastic polyolefin (TPO) formulations are widely used in automotive applications, such as airbag covers. Polymer blends are highly competitive for soft TPO applications in terms of both cost and performance. Such blends include, for example, polypropylene (PP) homopolymers or copolymers blended with polyolefin elastomers. However, a need still exists for low cost solutions (e.g., by reducing the elastomer content) where the impact performance of soft TPO formulations is improved at low temperatures, while maintaining high melt flow rate for easy processing, practical flexural modulus, and excellent temperature resistance.

Summary

[0003] Examples may be realized by providing a composition comprising:

(A) from 10 wt% to 90 wt% of a propylene component including at least one propylene based polymer having a propylene content of at least 50.0 wt%, based on the total weight of the propylene based polymer, and a melt flow rate from 0.5 g/10 min to 200.0 g/10 min (ASTM D-1238 or ISO 1133 at 230°C, 2.16 kg);

(B) from 1 wt% to 60 wt% of a polyolefin elastomer; and

(C) from 1 wt% to 20 wt% of a block composite comprising (i) an ethylene-propylene copolymer, (ii) an isotactic polypropylene copolymer, and (iii) a block copolymer including an ethylene-propylene soft block that has a same composition as the ethylene-propylene copolymer of the block composite and an isotactic polypropylene hard block that has a same composition as the isotactic polypropylene copolymer of the block composite.

[0003a] In an aspect of the present disclosure, there is provided a composition comprising:

(A) from 30 wt% to 70 wt% of a propylene component including at least one propylene based polymer having a propylene content of at least 50.0 wt%, based on the total weight of the propylene based polymer, and a melt flow rate from 0.5 g/10 min to 200.0 g/10 min

(ASTM D-1238 at 230°C, 2.16 kg), wherein the propylene based polymer is a polypropylene homopolymer;

(B) from 25 wt% to 55 wt% of a polyolefin elastomer, wherein the polyolefin elastomer is an ethylene/α-olefin copolymer, wherein the α-olefin is 1-butene or 1-octene; and

(C) from 1 wt% to 20 wt% of a block composite comprising (i) an ethylene-propylene copolymer, (ii) an isotactic polypropylene copolymer, and (iii) a block copolymer including an ethylene-propylene soft block that has a same composition as the ethylene-propylene copolymer of the block composite and an isotactic polypropylene hard block that has a same composition as the isotactic polypropylene copolymer of the block composite.

[0004] In further examples, the composition may optionally include from 0.1 wt% to 10 wt % of an antioxidant.

[0004a] In another aspect of the present disclosure, there is provided an article made from the composition as disclosed herein.

What is claimed is:

1. A composition comprising:

(A) from 30 wt% to 70 wt% of a propylene component including at least one propylene based polymer having a propylene content of at least 50.0 wt%, based on the total weight of the propylene based polymer, and a melt flow rate from 0.5 g/10 min to 200.0 g/10 min (ASTM D-1238 at 230°C, 2.16 kg), wherein the propylene based polymer is a polypropylene homopolymer;

(B) from 25 wt% to 55 wt% of a polyolefin elastomer, wherein the polyolefin elastomer is an ethylene/α-olefin copolymer, wherein the α-olefin is 1-butene or 1-octene; and

(C) from 1 wt% to 20 wt% of a block composite comprising (i) an ethylene-propylene copolymer, (ii) an isotactic polypropylene copolymer, and (iii) a block copolymer including an ethylene-propylene soft block that has a same composition as the ethylene-propylene copolymer of the block composite and an isotactic polypropylene hard block that has a same composition as the isotactic polypropylene copolymer of the block composite.

2. The composition of claim 1, further comprising (D) from 0.1 wt% to 10 wt% of an antioxidant.

3. The composition of claim 1 or 2, wherein the block composite has a density of from 0.860 to 0.890 g/cc (ASTM D792) and a melt flow rate of from 1 g/10 min to 20 g/10 min (ASTM D-1238 at 230°C, 2.16 kg).

4. The composition of any of the preceding claims, wherein the polyolefin elastomer has a density of from 0.855 to 0.875 g/cc (ASTM D792) and a melt index of from 0.1 g/10 min to 20 g/10 min (ASTM D-1238 at 230°C, 2.16 kg).

5. The composition of any of the preceding claims, further comprising a melt flow rate of greater than or equal to 7.0 g/10 min (ASTM D-1238 at 230°C, 2.16 kg).

6. The composition of any of the preceding claims, further comprising a notched impact of greater than or equal to 70.0 kJ/m^2 at -30 °C.

7. The composition of any of the preceding claims, further comprising a notched impact of greater than or equal to 85.0 kJ/m^2 at -35 °C.

8. The composition of any of the preceding claims, further comprising a notched impact of greater than 70.0 kJ/m^2 at -40 °C.

9. The composition of any of the preceding claims, further comprising a notched impact of greater than or equal to 52.0 kJ/m^2 at -45 °C.

10. The composition of any of the preceding claims, further comprising:

a flexural modulus of greater than 370 MPa;
a flexural yield strength of greater than 10 MPa;
a tensile yield strength of greater than or equal to 12 MPa at room temperature; and
a tensile yield strength of greater than or equal to 33 MPa at -40º C.

11. An article made from the composition of any of the preceding claims.