EN 11925-2 (small burner test) according to Euroclass B or BS 7837. EN 13823 (single burning item test) is required to be passed in a classification of B-S1-dO.

Flexible, coated fabrics for applications demanding fire resistance at the level of Euroclass B are commonly made from polymers with intrinsic fire resistance like polyvinylchloride, polyurethanes, fluoroelastomers or silicones.

At the same time, compounds for such applications have to show processability in extrusion coating, and good fabric penetration and adhesion. In the final application, they usually have to fulfill various properties like flexibility (a common target is a flexibility modulus below < 30 MPa), weldability, abrasion resistance, mechanical strength, printability, weathering- and UV-resistance, and fire resistance. To fulfill these demanding combinations of requirements, polyvinylchloride, fluoropolymers, or even silicones, are in common use today. TPOs were not used as they could not comply with the demanding property requirements. In particular, they lack flexibility in combination with sufficient fire resistance.

WO 2005/090427 describes a multi-block copolymer comprising in polymerized form ethylene and one or more copolymerizable comonomers, said copolymer containing therein two or more segments or blocks differing in comonomer content, crystallinity, density, melting point or glass transition temperature.

WO 2006/101924 describes blends of at least two polyolefins with ethylene/α-olefin (multi-block) interpolymers with improved compatibility.

WO 2006/101932 describes compositions comprising ethylene/α-olefin (multi-block) interpolymers and fillers.

WO/2011/008336 describes a multilayer structure comprising a top skin layer comprising a propylene/alpha-olefin copolymer blended with at least one other component; a middle foam layer comprising a propylene/alpha-olefin copolymer; and a bottom fabric layer comprising a nonwoven, polymeric, spunbond material.

SUMMARY

In ~~a first aspect~~ one embodiment of the present disclosure, there is provided a formulation comprising: i) an olefin block copolymer; ii) a propylene/α-olefin copolymer; and iii) a halogen-free flame-retardant.

In ~~a second aspect~~ another embodiment of the present disclosure, there is provided a multi-layer structure comprising a layer comprising a disclosed formulation as disclosed herein.

The present disclosure provides a formulation comprising (A) olefin block copolymer, (B) propylene-α-olefin interpolymer, and (C) halogen-free flame retardant. In addition, the present disclsoure provides a layer of and a multi-layer structure, the layer made from a composition comprising (A) olefin block copolymer, (B) propylene-α-olefin interpolymer, and (C) halogen-free flame retardant.

In one aspect, there is provided a formulation comprising:

i) an olefin block copolymer comprising an ethylene content of at least 50 mole percent of the whole polymer, the olefin block copolymer having a polydispersity from 1.7 to 3.5, a density of from 0.850 g/cc to 0.925 g/cc, and a melt index from 0.1 g/10 min to 30 g/10 min (according to ASTM D-1238 at 190°C/2.16 kg);

ii) a propylene/α-olefin copolymer comprising between 60 and less than 100 weight percent units derived from propylene and between greater than 0 and 40 weight percent units derived from at least one of ethylene and a C4-10 α -olefin, the propylene/α-olefin copolymer having a density greater than 0.855 g/cc and less than 0.895 g/cc, and a melt flow rate from 0.1 to 500 g/10 min (according to ASTM D-1238 at 230°C/2.16 kg); and,

iii) a halogen-free flame-retardant, a polymer to flame retardant ratio being less than 0.35.

CLAIMS:

1. A formulation comprising:

   i) an olefin block copolymer comprising an ethylene content of at least 50 mole percent of the whole polymer, the olefin block copolymer having a polydispersity from 1.7 to 3.5, a density of from 0.850 g/cc to 0.925 g/cc, and a melt index from 0.1 g/10 min to 30 g/10 min (according to ASTM D-1238 at 190°C/2.16 kg);

   ii) a propylene/α-olefin copolymer comprising between 60 and less than 100 weight percent units derived from propylene and between greater than 0 and 40 weight percent units derived from at least one of ethylene and a C4-10 α -olefin, the propylene/α-olefin copolymer having a density greater than 0.855 g/cc and less than 0.895 g/cc, and a melt flow rate from 0.1 to 500 g/10 min (according to ASTM D-1238 at 230°C/2.16 kg); and,

   iii) a halogen-free flame-retardant, a polymer to flame retardant ratio being less than 0.35.

2. A multi-layer structure comprising a layer comprising the formulation of Claim 1.

3. The formulation of Claim 1 having an organic/inorganic weight ratio of less than 0.35 and a polymer/flame retardant weight ratio of less than 0.35.

4. The formulation of Claim 1 wherein the halogen-free flame retardant is present in an amount of greater than 60 wt% based on total weight of formulation.

5. The formulation of Claim 1, wherein the halogen-free flame retardant includes magnesium hydroxide.

6. The formulation of Claim 1, wherein an organic to inorganic ratio of the formulation is less than 0.35.

~~7. The formulation of Claim 1, wherein a polymer to flame retardant ratio is less than 0.35.~~

7. The formulation of Claim 1, wherein the olefin block copolymer is present in an amount from 10 wt% to 25 wt% based on the total weight of the formulation.

8. The formulation of Claim 4, wherein the olefin block copolymer is an ethylene/octene block copolymer.

9. The formulation of Claim 8, wherein the ethylene content is greater than 80 mole percent of the whole polymer.

10. The formulation of Claim 9, wherein the melt index of the olefin block copolymer is from 0.1 g/10 min to 15 g/10 min (according to ASTM D-1238 at 190°C/2.16 kg).

11. The formulation of Claim 10, wherein the melt flow rate of the propylene/α-olefin copolymer is from 0.1 to 50 g/10 min (according to ASTM D-1238 at 230°C/2.16 kg).

12. The formulation of Claim 11, wherein the propylene/α-olefin copolymer has a Mw/Mn from 1.8 to 3.0.

13. The formulation of Claim 12, wherein the olefin block copolymer is present in an amount from 10 wt% to 25 wt% based on the total weight of the formulation.