MULTILAYERED FILMS, METHODS OF MANUFACTURE THEREOF AND ARTICLES COMPRISING THE SAME

BACKGROUND

[0001] This disclosure relates to multilayered films, methods of manufacture thereof and to articles comprising the same.

[0002] Polypropylene (PP) is often used in packaging industry in the form of films and containers for packaging food and non-food products. PP packages provide advantages of high stiffness, good clarity, and high temperature performance. PP or thermoplastic polyolefin (TPO) is frequently used in automotive industry for panels and parts. Such polymer panels and parts provide benefits of low weight, flexible styling and lower cost. However, limitations exist such as poor printability/paintability, poor scratch and mar resistance.

SUMMARY

[0003] Disclosed herein is a multilayer film comprising a first layer and a second layer; and a tie layer; where the tie layer is disposed between the first layer and the second layer; the first layer being disposed on a first surface of the tie layer; the second layer being disposed on a second surface of the tie layer; where the second surface is opposedly disposed to the first surface; where the tie layer comprises a crystalline block composite and a carboxylated olefin copolymer.

[0003a] In a first aspect, there is provided a multilayer film comprising:

a first layer and a second layer; and

a tie layer; where the tie layer is disposed between the first layer and the second layer; the first layer being disposed on a first surface of the tie layer; the second layer being disposed on a second surface of the tie layer; where the second surface is opposedly disposed to the first surface; where the tie layer comprises a crystalline block composite and a carboxylated olefin copolymer; where the carboxylated olefin copolymer is present in an amount of 30 to 60 weight percent, based on the total weight of the tie layer; and where the crystalline block composite comprises a crystalline ethylene based polymer, a crystalline alpha-olefin based polymer, and a block copolymer comprising a crystalline ethylene block and a crystalline alpha-olefin block, wherein the crystalline ethylene based polymer of the block copolymer is the same composition as the crystalline ethylene based polymer in the block composite and the crystalline alpha-olefin block of the block copolymer is the same composition as the crystalline alpha-olefin based polymer in the block composite.

[0003b] In a second aspect, there is provided an article comprising the multilayer film as defined herein.

[0004] Disclosed herein too is a method of manufacturing a multilayer film comprising coextruding a multilayered film comprising a first layer and a second layer; and a tie layer; where the tie layer is disposed between the first layer and the second layer; the first layer being disposed on a first surface of the tie layer; the second layer being disposed on a second surface of the tie layer; where the second surface is opposedly disposed to the first surface; where the tie layer comprises a crystalline block composite and a carboxylated olefin copolymer; and blowing or casting or extrusion coating the multilayered film.

[0004a] In a third aspect, there is provided a method of manufacturing a multilayer film comprising:

coextruding a multilayered film comprising:

a first layer and a second layer; and

a tie layer; where the tie layer is disposed between the first layer and the second layer; the first layer being disposed on a first surface of the tie layer; the second layer being disposed on a second surface of the tie layer; where the second surface is opposedly disposed to the first surface; where the tie layer comprises a crystalline block composite and a carboxylated olefin copolymer; where the crystalline block composite comprises a crystalline ethylene based polymer, a crystalline alpha-olefin based polymer, and a block copolymer comprising a crystalline ethylene block and a crystalline alpha-olefin block, wherein the crystalline ethylene based polymer of the block copolymer is the same composition as the crystalline ethylene based polymer in the block composite and the crystalline alpha-olefin block of the block copolymer is the same composition as the crystalline alpha-olefin based polymer in the block composite; and where the carboxylated olefin copolymer is present in an amount of 30 to 60 weight percent, based on the total weight of the tie layer; and

blowing or casting or extrusion coating the multilayered film.

BRIEF DESCRIPTION OF THE FIGURES

[0005] Figure 1 is a schematic representation of the multilayered film.

DETAILED DESCRIPTION

[0006] "Composition" and like terms mean a mixture of two or more materials, such as a polymer which is blended with other polymers or which contains additives, fillers, or the like. Included in compositions are pre-reaction, reaction and post-reaction mixtures the latter

What is claimed is:

1. A multilayer film comprising:

a first layer and a second layer; and

a tie layer; where the tie layer is disposed between the first layer and the second layer; the first layer being disposed on a first surface of the tie layer; the second layer being disposed on a second surface of the tie layer; where the second surface is opposedly disposed to the first surface; where the tie layer comprises a crystalline block composite and a carboxylated olefin copolymer; where the carboxylated olefin copolymer is present in an amount of 30 to 60 weight percent, based on the total weight of the tie layer; and where the crystalline block composite comprises a crystalline ethylene based polymer, a crystalline alpha-olefin based polymer, and a block copolymer comprising a crystalline ethylene block and a crystalline alpha-olefin block, wherein the crystalline ethylene based polymer of the block copolymer is the same composition as the crystalline ethylene based polymer in the block composite and the crystalline alpha-olefin block of the block copolymer is the same composition as the crystalline alpha-olefin based polymer in the block composite.

2. The multilayer film of claim 1, where the carboxylated olefin copolymer is a carboxylated ethylene copolymer or a carboxylated propylene copolymer.

3. The multilayer film of claim 1, where the carboxylated olefin copolymer is a glycidyl methacrylate ethylene copolymer.

4. The multilayer film of claim 1, where the carboxylated olefin copolymer comprises a carboxylated species in an amount of 0.05 to 20 wt%, based on the total weight of the carboxylated olefin copolymer.

5. The multilayer film of claim 1, where the tie layer further comprises an elastomer; and where the elastomer is a homogeneously branched ethylene-α-olefin copolymer, a polyolefin elastomer, a vinyl aromatic block copolymer, or a combination comprising at least one of the foregoing elastomers.

6. The multilayer film of claim 1, where the crystalline block composite has a melt flow ratio 0.1 to 30 dg/min, when measured as per ASTM D 1238 at 230°C and 2.16 kilograms.

7. The multilayer film of claim 1, where the crystalline block composite comprises 5 to 95 weight percent crystalline ethylene blocks and 95 to 5 wt percent crystalline alpha-olefin blocks.

8. The multilayer film of claim 1, where the first layer comprises polypropylene; and where the polypropylene is selected from the groups consisting of random copolymer

polypropylene, impact copolymer polypropylene, high impact polypropylene, high melt strength polypropylene, isotactic polypropylene, syndiotactic polypropylene, or a combination comprising at least one of the foregoing polypropylenes.

9. The multilayer film of claim 1, where the second layer comprises an ethylene ionomer, an acrylic acid ethylene copolymer or a combination thereof.

10. The multilayer film of claim 9, where the acrylic acid ethylene copolymer is derived from the polymerization of acrylic acid, methacrylic acid, ethacrylic acid, methyl

acrylate, ethyl acrylate, methyl methacrylate, ethyl methacrylate, propyl acrylate, propyl methacrylate, isopropyl acrylate, isopropyl methacrylate, butyl acrylate, butyl methacrylate, isobutyl acrylate, isobutyl methacrylate, tert-butyl acrylate, tert-butyl methacrylate, octyl acrylate, octyl methacrylate, undecyl acrylate, undecyl methacrylate, octadecyl acrylate, octadecyl methacrylate, dodecyl acrylate, dodecyl methacrylate, 2-ethylhexyl acrylate, 2-ethylhexyl methacrylate, isobornyl acrylate, isobornyl methacrylate, lauryl acrylate, lauryl methacrylate, 2-hydroxyethyl acrylate, 2-hydroxyethyl methacrylate, glycidyl acrylate, glycidyl methacrylate, poly(ethylene glycol)acrylate, poly(ethylene glycol)methacrylate, poly(ethylene glycol) methyl ether acrylate, poly(ethylene glycol) methyl ether methacrylate, poly(ethylene glycol) behenyl ether acrylate, poly(ethylene glycol) behenyl ether methacrylate, poly(ethylene glycol) 4-nonylphenyl ether acrylate, poly(ethylene glycol) 4-nonylphenyl ether methacrylate, poly(ethylene glycol) phenyl ether acrylate, poly(ethylene glycol) phenyl ether methacrylate, dimethyl maleate, diethyl maleate, dibutyl maleate, dimethyl fumarate, diethyl fumarate, dibutyl fumarate, dimethyl fumarate, vinyl acetic acid, vinyl acetate, vinyl propionate, or combinations thereof with an ethylene polymer.

11. The multilayer film of claim 10, where the acrylic acid ethylene copolymer is neutralized with an ion; and where the ion comprises Li, Na, K, Ag, Hg, Cu, Be, Mg, Ca, Sr, Ba, Cd, Sn, Pb, Fe, Co, Zn, Ni, Al, Sc, Hf, Ti, Zr, Ce, or combinations thereof.

12. The multilayer film of claim 1, where the second layer comprises a metal foil; where the metal foil comprises aluminum, copper, gold or tin.

13. An article comprising the multilayer film of claim 1.

14. A method of manufacturing a multilayer film comprising:

coextruding a multilayered film comprising:

a first layer and a second layer; and

a tie layer; where the tie layer is disposed between the first layer and the second layer; the first layer being disposed on a first surface of the tie layer; the second layer being disposed on a second surface of the tie layer; where the second surface is opposedly disposed to the first surface; where the tie layer comprises a crystalline block composite and a carboxylated olefin copolymer; where the crystalline block composite comprises a crystalline ethylene based polymer, a crystalline alpha-olefin based polymer, and a block copolymer comprising a crystalline ethylene block and a crystalline alpha-olefin block, wherein the crystalline ethylene based polymer of the block copolymer is the same composition as the crystalline ethylene based polymer in the block composite and the crystalline alpha-olefin block of the block copolymer is the same composition as the crystalline alpha-olefin based polymer in the block composite; and

where the carboxylated olefin copolymer is present in an amount of 30 to 60 weight percent, based on the total weight of the tie layer; and

blowing or casting or extrusion coating the multilayered film.

15. The method of claim 14, further comprising laminating the film in a roll mill.

16. The method of claim 14, further comprising laminating the film in a compression mold.