[0008] In one aspect, the present ~~disclosure provides~~invention refers to a heat shrink ~~label~~ film comprising: a core layer having an upper surface and a lower surface, the core comprising a blend of (A) ~~about~~ 5% to 35% ~~or less~~by weight of an alpha-olefin copolymer comprising a copolymer of an ethylene with an alpha-olefin or a propylene with an alpha-olefin~~;~~, wherein the alpha-olefin copolymer has a melt flow of 2 to 8 g/10min; (B) ~~about~~ 60% to 90% by weight ~~or more~~ of a polyolefin copolymer of propylene-ethylene or butylene-ethylene, wherein the ethylene content is 10% or less by weight if the polyolefin copolymer is propylene-ethylene and 0.5% to 12% by weight if the polyolefin copolymer is butylene-ethylene the polyolefin copolymer having a melt flow of 2 to 10 g/10 min; and (C) ~~the balance being~~0.1% to 30% by weight of an olefin homopolymer, wherein the olefin homopolymer is a butylene homopolymer or a propylene homopolymer; a first skin layer disposed about the upper surface of the core layer; and a second skin layer disposed about the lower surface of the core layer, wherein at least one of the first and second skin layers comprises a glycol modified polyester, wherein the film is uniaxially oriented. Also disclosed is a heat shrink label comprising a core layer having an upper surface and a lower surface, the core comprising a blend of (A) about 35% or less of an alpha-olefin copolymer comprising a copolymer of a ethylene or propylene and an alpha-olefin; (B) about 60% or more of a polyolefin; and (C) the balance being an olefin homopolymer; a first skin layer disposed about the upper surface of the core layer; and a second skin layer disposed about the lower surface of the core layer.

[0009] The film may have a shrinkage of at least about 30%. The films have good shrinkage and avoid end puckering. Additionally, the films are printable, even with gravure printing.

[0009a] In another aspect, the present disclosure provides an article encapsulated with the multilayer heat shrink film as disclosed herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is a cross-sectional view of a label in accordance with an embodiment of the present invention; and

[0011] FIG. 2 is a cross-sectional view of a label in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0012] The present invention provides multilayer shrink films and labels produced therefrom. The films and labels may exhibit a shrinkage of greater than 30% and are suitable to encapsulate a wide range of articles including, but not limited to batteries.

[0013] In accordance with aspects of the present invention, a multilayer shrink film comprises a core layer and skin layers disposed on opposing surfaces of the core layer. The shrink film may comprise additional layers as may be desired including tie layers, adhesive layers, etc. As shown in FIG. 1, a shrink film 100 in accordance with one embodiment of the present invention may comprise a core layer 110

CLAIMS

Having thus described the invention, we claim:

1. A heat shrink film comprising:

a core layer having an upper surface and a lower surface, the core comprising a blend of

(A) 35% or less of an alpha-olefin copolymer comprising a copolymer of an ethylene with an alpha-olefin or a propylene with an alpha-olefin, wherein the alpha-olefin copolymer has a melt flow of 2 to 8 g/10min;

(B) 60% or more of a polyolefin copolymer of propylene-ethylene or butylene-ethylene, wherein the ethylene content is 10% or less by weight if the polyolefin copolymer is propylene-ethylene and 0.5% to 12% by weight if the polyolefin copolymer is butylene-ethylene the polyolefin copolymer having a melt flow of 2 to 10 g/10 min; and

(C) the balance being an olefin homopolymer, wherein the olefin homopolymer is a butylene homopolymer or a propylene homopolymer;

a first skin layer disposed the upper surface of the core layer; and

a second skin layer disposed the lower surface of the core layer,

wherein at least one of the first and second skin layers comprises a glycol modified polyester.

2. The heat shrink film of claim 1, where the core comprises from 5 to 35% of the alpha-olefin copolymer, or wherein the core comprises from 15 to 30% of the alpha-olefin copolymer, or wherein the core comprises 20% of the alpha-olefin copolymer.

3. The heat shrink film of any of claims 1-2, wherein the alpha-olefin copolymer is a copolymer of (i) ethylene or propylene, and (ii) a C_3-C_{12} alpha-olefin, or wherein the alpha-olefin copolymer is a copolymer of (i) ethylene or propylene, and (ii) 1-butene or 1-hexene.

4. The heat shrink film of any of claims 1-3, wherein the core comprises from 60 to 90% by weight of the polyolefin copolymer, or wherein the core layer comprises from 60 to 80% by weight of the polyolefin copolymer.

5. The heat shrink film of any of claims 1-4, wherein the core comprises from 1 to 30% by weight of the olefin homopolymer.

6. The heat shrink film of any of claims 1-5, wherein the skin layers individually comprise a polyolefin, a polyester, a glycol modified polyester, or a combination of two or more thereof.

7. The heat shrink film of any of claims 1-6, wherein an adhesive layer is disposed on an outer surface of one of the skin layers; and/or wherein at least one of the skin layers is printable; and/or wherein the thickness ratio of the core layer to the skin layers combined is from 70:30 to 90:10; and/or wherein the thickness ratio of the first skin layer to the core to the second skin layer is 5-20:90-60:20-5.

8. The heat shrink film of any of claims 1-7 further comprising a tie layer disposed between the core layer and at least one of the skin layers.

9. An article encapsulated with the multilayer heat shrink film of any of claims 1-8.

10. The article of claim 9, wherein the article is a battery.

11. The heat shrink film of any of claims 1-8, wherein the glycol modified polyester is polyethylene terephthalate.

CLAIMS

Having thus described the invention, we claim:

1. A heat shrink film comprising:

a core layer having an upper surface and a lower surface, the core comprising a blend of

(A) 5% to 35% by weight of an alpha-olefin copolymer comprising a copolymer of an ethylene with an alpha-olefin or a propylene with an alpha-olefin, wherein the alpha-olefin copolymer has a melt flow of 2 to 8 g/10min;

(B) 60% to 90% by weight of a polyolefin copolymer of propylene-ethylene or butylene-ethylene, wherein the ethylene content is 10% or less by weight if the polyolefin copolymer is propylene-ethylene and 0.5% to 12% by weight if the polyolefin copolymer is butylene-ethylene the polyolefin copolymer having a melt flow of 2 to 10 g/10 min; and

(C) 0.1% to 30% by weight of an olefin homopolymer, wherein the olefin homopolymer is a butylene homopolymer or a propylene homopolymer;

a first skin layer disposed the upper surface of the core layer; and

a second skin layer disposed the lower surface of the core layer,

wherein at least one of the first and second skin layers comprises a glycol modified polyester,

wherein the film is uniaxially oriented.

2. The heat shrink film of claim 1, wherein the core comprises from 15 to 30% of the alpha-olefin copolymer, or wherein the core comprises 20% of the alpha-olefin copolymer.

3. The heat shrink film of any of claims 1-2, wherein the alpha-olefin copolymer is a copolymer of (i) ethylene or propylene, and (ii) a C_3-C_{12} alpha-olefin, or wherein the alpha-olefin copolymer is a copolymer of (i) ethylene or propylene, and (ii) 1-butene or 1-hexene.

4. The heat shrink film of any of claims 1-3, wherein the core layer comprises from 60 to 80% by weight of the polyolefin copolymer.

5. The heat shrink film of any of claims 1-4, wherein the core comprises from 1 to 30% by weight of the olefin homopolymer.

6. The heat shrink film of any of claims 1-5, wherein the skin layers individually comprise a polyolefin, a polyester, a glycol modified polyester, or a combination of two or more thereof.

7. The heat shrink film of any of claims 1-6, wherein an adhesive layer is disposed on an outer surface of one of the skin layers; and/or wherein at least one of the skin layers is printable; and/or wherein the thickness ratio of the core layer to the skin layers combined is from 70:30 to 90:10; and/or wherein the thickness ratio of the first skin layer to the core to the second skin layer is 5-20:90-60:20-5.

8. The heat shrink film of any of claims 1-7 further comprising a tie layer disposed between the core layer and at least one of the skin layers.

9. An article encapsulated with the multilayer heat shrink film of any of claims 1-8.

10. The article of claim 9, wherein the article is a battery.

11. The heat shrink film of any of claims 1-8, wherein the glycol modified polyester is polyethylene terephthalate.

12. The heat shrink film of any of claims 1-8, wherein the heat shrink film is uniaxially oriented in the machine direction.

13. The heat shrink film of any of claims 1-8, wherein the heat shrink film has a shrinkage of at least 30% as determined at 270 °F (132.2 °C) by ASTM D1204.