FOAMABLE COMPOSITIONS, FOAMS AND ARTICLES THEREOF

FIELD OF THE INVENTION

[1] This invention relates to foams comprising polyolefin blends and methods of making and using the foams in various applications.

BACKGROUND OF THE INVENTION

[2] Conventional wet suits which have heretofore been employed for skin-diving, scuba-diving, surfing, fishing, kayaking and other such activities are generally laminates made of materials comprising a closed-cell sponge sheet as a core layer and stretch fabrics adhesively bonded to the sheet at one or two surfaces. The sponge sheet provides good heat retention properties and good workability for movement of human body. Neoprene (chloroprene rubber - CR) has been the dominate material for about 60 years to make the foam due to excellent softness, flexibility, handfeel, mechanical strength (such as low compression set), weatherability, insulation and waterproof properties. A nylon jersey or tricot having good stretchability provides good wearability for the wet suit. The exterior surface of the laminate is smooth or embossed and usually adhesive coated with a polyurethane film that provides water-repellence, durability, colorance, etc.

[3] It would be useful to provide a lighter, chlorine free material suitable for wetsuits, particularly for sustainability reasons.

SUMMARY

[4] The disclosure provides a composition suitable for use in wetsuit and related applications. In particular, the disclosure provides a foamable composition comprising: one or more olefin block copolymers; one or more olefin copolymers; an oil; a crosslinking agent; and, a blowing agent. The disclosure also provides a foam, a laminate, an article and a wetsuit made from the foamable composition.

[4a] In a first aspect, there is provided a foamable composition comprising:

a) one or more olefin block copolymers having a Mw/Mn from 1.7 to 3.5, and at least one melting point, Tm, in degrees Celsius, and a density, d, in grams/cubic centimeter, wherein the numerical values of Tm and d correspond to the relationship:

$$Tm > -2002.9 + 4538.5(d) - 2422.2(d)^2;$$

b) one or more olefin copolymers, comprising an ethylene-propylene-diene monomer rubber and/or an ethylene/α-olefin copolymer;

c) an oil;

d) a crosslinking agent; and,

e) a blowing agent.

[4b] In a second aspect, there is provided a foam made from the foamable composition as defined above.

[4c] In a third aspect, there is provided a laminate comprising the foam as defined above.

[4d] In a fourth aspect, there is provided an article comprising the laminate as defined above.

[4e] In a fifth aspect, there is provided an article comprising the foam as defined above.

[4f] In a sixth aspect, there is provided a wetsuit comprising the foam as defined above.

DETAILED DESCRIPTION OF THE INVENTION

[5] "Polymer" means a polymeric compound prepared by polymerizing monomers, whether of the same or a different type. The generic term "polymer" embraces the terms "homopolymer," "copolymer," "terpolymer" as well as "interpolymer."

[6] "Interpolymer" means a polymer prepared by the polymerization of at least two different types of monomers. The generic term "interpolymer" includes the term

CLAIMS

What is claimed is:

1. A foamable composition comprising:
   a) one or more olefin block copolymers having a Mw/Mn from 1.7 to 3.5, and at least one melting point, Tm, in degrees Celsius, and a density, d, in grams/cubic centimeter, wherein the numerical values of Tm and d correspond to the relationship:

$$Tm > -2002.9 + 4538.5(d) - 2422.2(d)^2;$$

   b) one or more olefin copolymers, comprising an ethylene-propylene-diene monomer rubber and/or an ethylene/α-olefin copolymer;
   c) an oil;
   d) a crosslinking agent; and,
   e) a blowing agent.
2. The foamable composition of Claim 1 wherein one or more of the olefin block copolymers is mesophase separated and has a delta comonomer of greater than 18.5 mol%.
~~3. The foamable composition of Claim 1 wherein the olefin copolymer comprises ethylene-propylene-diene monomer rubber and/or an ethylene/α-olefin copolymer.~~
4.3. The foamable composition of Claim 13 wherein
   a) the olefin block copolymer is present in an amount of 5 wt% to 40 wt%, preferably 10 wt% to 30 wt%, more preferably 10 wt% to 25 wt%;
   b) the ethylene-propylene-diene- monomer rubber is present in an amount of 5 wt% to 40 wt%, preferably 5 wt% to 30 wt%;
   c) the ~~mineral~~ oil is present in an amount of 15 wt% to 45 wt%, preferably 20 wt% to 40 wt%, more preferably 25 wt% to 35wt%;
   d) the crosslinking agent is present in an amount of 1 – 6 phr, preferably 2-5 phr.
   e) the blowing agent is present in an amount of 1-8 phr, preferably 2-6.
5.4. A foam made from the foamable composition of Claim 1.
6.5. The foam of Claim 45 having a density of 0.05 g/cc to 0.2 g/cc, a 60% modulus of 0.60 Kg/cm^2 to 1.50 Kg/cm^2, and a compression set of 15% to 35%.
7.6. A laminate comprising the foam of Claim 45.
8.7. An article comprising the laminate of Claim 67.
9.8. An article comprising the foam of Claim 45.
10.9. A wetsuit comprising the foam of Claim 45.