BLENDS FOR FOAMS, FOAMS MANUFACTURED THEREFROM AND ARTICLES COMPRISING THE SAME

BACKGROUND

This disclosure relates to blend for foams, foams manufactured therefrom and to articles comprising the same.

Polymeric foams are often used in a wide variety of different applications as thermal insulation, sound insulation, cushioning, filters, vibration and impact damping, and the like. Applications using such polymeric foams include electronic devices, food packing materials, clothing materials, building materials, interior and exterior parts of automobiles and home electric appliances, footwear, and the like.

Of the many commercially available foams, polyolefin foams and polyethylene vinyl/acetate foams are often used in footwear where properties such as cushioning and flexibility are desirable. Polyolefin foams have a lower shrinkage and compression set at elevated temperatures when compared with poly(ethylene/vinyl acetate) foams. This difference is often attributed to the melting point of the polyolefin foams and to the degree of curing amongst other factors.

It is therefore desirable to manufacture polyolefin foams that display better compression set and shrinkage when compared with poly(ethylene/vinyl acetate) foams so that products that use these foams will have superior properties when compared with products that use poly(ethylene/vinyl acetate) foams.

SUMMARY

Disclosed herein is a foam composition comprising an olefin copolymer that comprises ethylene and an α-olefin or propylene and an α-olefin; an ionomer that comprises copolymer of ethylene and a carboxylic acid; where the ionomer is neutralized with a metal ion; a crosslinking agent; and a blowing agent.

In one aspect, there is provided a foam composition comprising:

an olefin copolymer that comprises ethylene and an α-olefin or propylene and an α-olefin; wherein the olefin copolymer comprises a block copolymer and a random copolymer;

0.5 to 10 wt% of an ionomer that comprises copolymer of ethylene and a carboxylic acid; where the ionomer is neutralized with a metal ion;

a crosslinking agent; and

a blowing agent; where all weight percents are based on the total weight of the foam composition; where a foam manufactured from the composition has an average cell size of 45 to 90 micrometers and where the foam has a type C tear strength of 14.5 to 17 Newtons per millimeter and where an average stress at break is greater than 2.75 Newtons per square millimeter.

In another aspect, there is provided an article manufactured from the foam compositions as disclosed herein.

Disclosed herein is a method of manufacturing a foam composition comprising blending together an olefin copolymer that comprises ethylene and an α-olefin or propylene and an α-olefin; an ionomer that comprises copolymer of ethylene and a carboxylic acid; where the ionomer is neutralized with a metal ion; a crosslinking agent; and a blowing agent to form the

foam composition; heating the composition to activate the blowing agent; and crosslinking the composition.

In yet another aspect, there is provided a method of manufacturing a foam composition comprising:

blending together an olefin copolymer that comprises ethylene and an α-olefin or propylene and an α-olefin; an ionomer that comprises copolymer of ethylene and a carboxylic acid; where the ionomer is neutralized with a metal ion; a crosslinking agent; and a blowing agent to form the foam composition; wherein the olefin copolymer comprises a block copolymer and a random copolymer; and wherein the ionomer is present in an amount of 0.5 to 10 wt%, based on the total weight of the foam composition;

heating the composition to activate the blowing agent; and

crosslinking the composition; where a foam manufactured from the composition has an average cell size of 45 to 90 micrometers and where the foam has a type C tear strength of 14.5 to 17 Newtons per millimeter and where an average stress at break is greater than 2.75 Newtons per square millimeter.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows the melting point/density relationship for olefin block copolymers;

Figure 2 shows photomicrographs for some of the comparative foams as well as some of the inventive foams; and

Figure 3 shows photomicrographs for some of the comparative foams.

DETAILED DESCRIPTION

"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 of which will include reaction products and by-products as well as unreacted components of the reaction mixture and decomposition products, if any, formed from the one or more components of the pre- reaction or reaction mixture.

"Blend", "polymer blend" and like terms mean a composition of two or more polymers. Such a blend may or may not be miscible. Such a blend may or may not be phase separated. Such a blend may or may not contain one or more domain configurations, as determined from transmission electron spectroscopy, light scattering, x-ray scattering, and any other method known in the art. Blends are not laminates, but one or more layers of a laminate may contain a blend.

"Polymer" means a compound prepared by polymerizing monomers, whether of the same or a different type. The generic term polymer thus embraces the term homopolymer, usually employed to refer to polymers prepared from only one type of monomer, and the term interpolymer as defined below. It also embraces all forms of interpolymers, e.g., random, block, and the like. The terms "ethylene/a-olefin polymer" and "propylene/a-olefin polymer" are indicative of interpolymers as described below. It is noted that although a polymer is often referred to as being "made of" monomers, "based on" a specified monomer or monomer type, "containing" a specified monomer content, or the like, this is obviously understood to be

What is claimed is:

1. A foam composition comprising:

an olefin copolymer that comprises ethylene and an α-olefin or propylene and an α-olefin; wherein the olefin copolymer comprises a block copolymer and a random copolymer;

0.5 to 10 wt% of an ionomer that comprises copolymer of ethylene and a carboxylic acid; where the ionomer is neutralized with a metal ion;

a crosslinking agent; and

a blowing agent; where all weight percents are based on the total weight of the foam composition; where a foam manufactured from the composition has an average cell size of 45 to 90 micrometers and where the foam has a type C tear strength of 14.5 to 17 Newtons per millimeter and where an average stress at break is greater than 2.75 Newtons per square millimeter.

2. The foam composition of Claim 1, where the olefin copolymer is an olefin block copolymer and is present in the foam composition in an amount of 10 to 99 wt%, based on the total weight of the foam composition.

3. The foam composition of Claim 1, where the α-olefin is octene.

4. The foam composition of Claim 1, where the carboxylic acid is a (meth)acrylic acid and where the metal ion is zinc, sodium, aluminum or a combination thereof.

5. The foam composition of Claim 1, where the crosslinking agent is a peroxide and where the blowing agent is a azodicarbonamide.

6. An article manufactured from the foam compositions of Claims 1 through 5.

7. The article of Claim 6, where the article is footwear.

8. A method of manufacturing a foam composition comprising:

blending together an olefin copolymer that comprises ethylene and an α-olefin or propylene and an α-olefin; an ionomer that comprises copolymer of ethylene and a carboxylic acid; where the ionomer is neutralized with a metal ion; a crosslinking agent; and a blowing agent to form the foam composition; wherein the olefin copolymer comprises a block copolymer and a random copolymer; and wherein the ionomer is present in an amount of 0.5 to 10 wt%, based on the total weight of the foam composition;

heating the composition to activate the blowing agent; and

crosslinking the composition; where a foam manufactured from the composition has an average cell size of 45 to 90 micrometers and where the foam has a type C tear strength of 14.5 to 17 Newtons per millimeter and where an average stress at break is greater than 2.75 Newtons per square millimeter.

9. The method of Claim 8, further comprising molding the foam composition.