FOAM BEAD AND SINTERED FOAM STRUCTURE

BACKGROUND

The present disclosure relates to ethylene-based polymer foams, also known as polyethylene foams.

Polyethylene foams are utilized in footwear components, such as midsole applications. Crosslinked ethylene-based polymers including ethylene vinyl acetate (EVA) copolymer and polyolefin elastomers have traditionally dominated the polyethylene foam market in footwear as they can easily be foamed with a chemical blowing agent. However, chemical blowing agents are known to produce unpleasant odors and contaminate molds.

Furthermore, crosslinked ethylene-based polymer foams are not recyclable because they are thermoset (rather than thermoplastic). In other words, crosslinked ethylene-based polymer foam beads cannot be fused together to form a uniform sintered foam structure, such as a foam midsole. Consequently, crosslinked ethylene-based polymer foams are not traditionally prepared using a foam bead process, which utilizes a physical blowing agent.

The art recognizes the need for an ethylene-based foam bead that exhibits suitable density for foam sole and foam midsole applications. The art also recognizes the need for an ethylene-based sintered foam structure that exhibits suitable density for foam sole and foam midsole applications.

SUMMARY

The instant disclosure provides a foam bead. In an embodiment, a foam bead is provided that is formed from a composition containing (A) a silane-functionalized ethylene/α-olefin multi-block interpolymer. In an embodiment, the composition further includes (B) an ethylene/α-olefin multi-block interpolymer.

In one aspect, the instant disclosure provides a foam bead formed from a composition comprising:

(A) a silane-functionalized ethylene/α-olefin multi-block interpolymer,

wherein the foam bead has a gel content from 0% to 4%.

The instant disclosure also provides a sintered foam structure. In an embodiment, a sintered foam structure is provided that is formed from foam beads that are formed from a composition containing (A) a silane-functionalized ethylene/α-olefin multi-block interpolymer. In an embodiment, the composition further includes (B) an ethylene/α-olefin multi-block interpolymer.

In another aspect, the instant disclosure provides a sintered foam structure formed from foam beads that are formed from a composition comprising:

(A) a silane-functionalized ethylene/α-olefin multi-block interpolymer; and

(B) an ethylene/α-olefin multi-block interpolymer,

wherein the sintered foam structure has:

(i) a density from 0.05g/cm^3 to less than 0.2 g/cm^3;

(ii) a compression set (50%, 50 ^{o}C/6 hours) of less than 70%; and

(iii) a gel content from greater than 5% to 20%.

In another aspect, the instant disclosure provides an article comprising at least one component formed from the sintered foam structure as described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a scanning electron microscope (SEM) micrograph of Ex 2 Structure.

Figure 2 is a scanning electron microscope (SEM) micrograph of CS 1 Structure.

DEFINITIONS

Any reference to the Periodic Table of Elements is that as published by CRC Press, Inc., 1990–1991. Reference to a group of elements in this table is by the new notation for numbering groups. For purposes of United States patent practice, the contents of any referenced patent, patent

CLAIMS

We claim:

1. A foam bead formed from a composition comprising:

   (A) a silane-functionalized ethylene/α-olefin multi-block interpolymer,

   wherein the foam bead has a gel content from 0% to 4%.

2. The foam bead of claim 1, wherein the composition comprises:

   (A) the silane-functionalized ethylene/α-olefin multi-block interpolymer; and

   (B) an ethylene/α-olefin multi-block interpolymer.

3. The foam bead of claim 1 or claim 2, wherein the foam bead has a gel content from 0% to 2%.

4. The foam bead of any one of claims 1–3, wherein the silane-functionalized ethylene/α-olefin multi-block interpolymer has a density from 0.865 g/cc to 0.900 g/cc.

5. The foam bead of any one of claims 1–4, wherein the silane-functionalized ethylene/α-olefin multi-block interpolymer has a melt index (I2) from 0.05 g/10 min to 5.0 g/10 min.

6. The foam bead of any one of claims 1–5, wherein the weight ratio of (B) ethylene/α-olefin multi-block interpolymer and (A) silane-functionalized ethylene/α-olefin multi-block interpolymer is from 0 to 2.50.

7. A sintered foam structure formed from foam beads that are formed from a composition comprising:

   (A) a silane-functionalized ethylene/α-olefin multi-block interpolymer; and

   (B) an ethylene/α-olefin multi-block interpolymer,

   wherein the sintered foam structure has:

   (i) a density from 0.05g/cm^3 to less than 0.2 g/cm^3;

   (ii) a compression set (50%, 50 ^oC/6 hours) of less than 70%; and

   (iii) a gel content from greater than 5% to 20% .

8. The sintered foam structure of claim 7, wherein the weight ratio of (B) ethylene/α-olefin multi-block interpolymer and (A) silane-functionalized ethylene/α-olefin multi-block interpolymer is from 0.25 to 2.50.

9. An article comprising at least one component formed from the sintered foam structure of any one of claim 7 or claim 8.