OLEFIN MULTI-BLOCK COPOLYMER / SILICONE RUBBER COMPOSITIONS AND FOAMS FORMED FROM THE SAME

BACKGROUND

Olefin block copolymers (OBC) can be used to form lightweight shoe midsoles. For use as a unitsole foam, the polymer composition should have good abrasion resistance and good wet traction (high wet coefficient of friction (wet COF)). Although a polydimethyl-siloxane can be used to improve abrasion resistance, the wet COF will typically decrease, resulting in poor wet traction. Foamable compositions and/or other elastomeric compositions are described in the following references: US6767931, US2011/0178195, US2015/0166755, US2016/0160037, KR1075070B1 (abstract), US7671106, US6013217, US2012/0322905, JP3665446B2 (abstract), CN105670199A (abstract), CN103709581B (abstract). However, there is a need for a new polymer compositions that provides good abrasion resistance and good wet COF. There is a further need for such compositions that have good mechanical properties, such as compression set, resilience and tensile strength. These needs have been met by the following invention.

SUMMARY

A composition comprising at least the following components:

A) an olefin multi-block copolymer;

B) a silicone rubber that comprises pendant vinyl groups, and optionally comprises terminal vinyl groups.

In one aspect, the present disclosure refers to a composition comprising at least the following components:

A) an olefin multi-block copolymer; and

B) a silicone rubber that comprises pendant vinyl groups and terminal vinyl groups,

wherein the silicone rubber has a viscosity $\geq 10^6$ cSt at 25°C.

In another aspect, the present disclosure refers to an article comprising at least one component formed from the composition as disclosed herein.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 depicts a schematic of different samples cut from a Bun foam.

Figure 2 depicts SEM images of Comparative Example 2 (far left), Comparative Example 3 (middle) and Inventive Example 1 (far right).

DETAILED DESCRIPTION

OBC/silicone rubber compositions have been discovered for unitsole foam applications. It has been discovered that these compositions provide excellent crosslinking mechanics during foaming, and result in a foam with good (low DIN) abrasion resistance, without significant decreasing the wet COF. It has also been discovered that these compositions have good mechanical properties, such as compression set, resilience and

CLAIMS

1. A composition comprising at least the following components:

A) an olefin multi-block copolymer; and

B) a silicone rubber that comprises pendant vinyl groups and terminal vinyl groups,

wherein the silicone rubber has a viscosity $\geq 10^6$ cSt at 25°C.

2. The composition of claim 1, wherein the silicone rubber has a weight average molecular weight (Mw) ≥ 200,000 g/mole.

3. The composition of claim 1 or claim 2, wherein the silicone rubber comprises one or more structures selected from i), and optionally one or more structures selected from ii) below:

i) -O-[Si(R)(CH=CH_2)]-[Si(R')(R")]-O- , where R, R' and R" are each, independently, an alkyl group, and further a C1-C6 alkyl group, and wherein R, R' and R" may all be the same alkyl group;

ii) H_2C=CH-[Si(R^{IV})(R^{V})]-O- , where R^{IV} and R^{V} are each, independently, an alkyl group, and further a C1-C6 alkyl group, and wherein R^{IV} and R^{V} may be the same alkyl group.

4. The composition of any one of the previous claims, wherein the olefin/alpha-olefin block copolymer has a density from 0.866 g/cc to 0.887 g/cc.

5. The composition of any one of the previous claims, wherein the olefin/alpha-olefin block copolymer has a melt index (I2) from 0.5 to 5.0 g/10 min (190°C and 2.16 kg).

6. The composition of any one of the previous claims, wherein the olefin multi-block copolymer is an ethylene/α-olefin multi-block copolymer.

7. The composition of any one of the previous claims, wherein the composition comprises from 10 wt% to 30 wt% of component B, based on weight of component A and component B.

8. An article comprising at least one component formed from the composition of any one of the previous claims.

9. The article of claim 8, wherein the article is a foam.