processability for compounding, calendaring and lamination, as well as performance of the final products.

SUMMARY ~~OF THE INVENTION~~

[0004a] In a first aspect of the present disclosure, there is provided a foamable composition comprising:

(A) 5 to 95 weight percent propylene/ethylene copolymer based on the weight of the composition, the propylene/ethylene copolymer having substantially isotactic propylene sequences, a melt flow rate of 0.1 to 25 g/10 min, a molecular weight distribution of 3.5 or less,

(B) 200 to 3,000 ppm molecular melt (MM) based upon the weight of the propylene/ethylene copolymer, the molecular melt (MM) comprising 4,4'-oxydi-benzenesulfonylazide (DPO-BSA) and an antioxidant, and

(C) 1 to 30 weight percent blowing agent based upon the weight of the propylene/ethylene copolymer.

[0004b] In a second aspect of the present disclosure, there is provided a process for preparing a foam made from the foamable composition as defined above, the process comprising the steps of:

(A) blending a DPO-BSA molecular melt, blowing agent, and propylene/ethylene copolymer;

(B) compounding the blend at a temperature at which the copolymer is melted but neither the blowing agent nor DPO-BSA are activated, and

(C) raising the temperature of the composition such that the blowing agent and DPO-BSA are activated sufficient to foam the composition.

[0004c] In a third aspect of the present disclosure, there is provided an artificial leather comprising foam made by the process as defined above.

[0005] In one embodiment of the ~~invention~~present disclosure, there is a foamable composition comprising (A) a propylene-α-olefin copolymer, (B) a molecular melt (MM) comprising 4,4'-oxydi-benzenesulfonylazide (DPO-BSA) and an antioxidant, and (C) a blowing agent. In one embodiment the foamable composition comprises at least 300 parts per million (ppm) DPO-BSA. In one embodiment the foamable composition further comprises one or more (i) polymers other than the propylene-α-olefin copolymer, (ii) foaming additives, (iii) fillers, and (iv) processing aids.

[0006] In one embodiment of the ~~invention~~present disclosure, there is a process for preparing a foam, the process comprising the steps of: (A) blending a DPO-BSA molecular melt, blowing agent, propylene-α-olefin copolymer and other ingredients, if any; (B) compounding the blend at a temperature at which the copolymer is melted but neither the blowing agent nor DPO-BSA are activated, and (C) raising the temperature of the composition such that the blowing agent and DPO-BSA are activated sufficient to foam the composition. The components of the composition can be mixed by any one of a number of different methods, e.g., dry blending using conventional equipment and techniques, or melt blending using an extruder.

[0007] The ~~inventive~~ technology affords a wide foaming window and better foam stability (more than 200s at 220°C) without the use of SEBS. The foamable composition is a cost effective and has no influence on material processability during compounding, calendaring and lamination process in making artificial leather products.

[0008] The ~~invention~~present disclosure comprises the following embodiments:

1. A foamable composition comprising (A) a propylene-α-olefin copolymer, (B) a molecular melt (MM) comprising 4,4'-oxydi-benzenesulfonylazide (DPO-BSA) and an antioxidant, and (C) a blowing agent.

2. The foamable composition of embodiment 1 in which the propylene-α-olefin copolymer has substantially isotactic propylene sequences.

3. The foamable composition of any one of embodiments 1-2 in which the propylene-α-olefin copolymer has a melt flow rate of 0.1 to 25 g/10 min, a molecular weight distribution of 3.5 or less, and the α-olefin is ethylene.

CLAIMS

1. A foamable composition comprising (A) a propylene-α-olefin copolymer, (B) a molecular melt (MM) comprising 4,4'-oxydi-benzenesulfonylazide (DPO-BSA) and an antioxidant, and (C) a blowing agent.

2. The foamable composition of Claim 1 in which the propylene-α-olefin copolymer has substantially isotactic propylene sequences.

3. The foamable composition of Claim 2 in which the propylene-α-olefin copolymer has a melt flow rate of 0.1 to 25 g/10 min, a molecular weight distribution of 3.5 or less, and the α-olefin is ethylene.

4. The foamable composition of Claim 3 in which the propylene-α-olefin copolymer is present in an amount of 5 to 95 weight percent based on the weight of the composition, and the molecular melt is present in an amount of 200 to 3,000 ppm and the blowing agent is present in an amount of 1 to 30 weight percent, both based upon the weight of the propylene-α-olefin copolymer.

5. The foamable composition of Claim 4 in which the antioxidant is a hindered phenolic compound that does not contain phosphite containing a phosphorus atom in the +3 oxidation state, and the DPO-BSA and antioxidant are present in the molecular melt at mole ratio of 1:10 to 10:1.

6. The foamable composition of Claim 5 in which the molecular melt comprises one or more of an internal lubricant, stabilizing agent, release agent, plasticizer, ultra-violet stabilizer and catalyst neutralizer.

7. The foamable composition of the Claim 6 in which the blowing agent is azodicarbonamide.

8. A process for preparing a foam, the process comprising the steps of: (A) blending a DPO-BSA molecular melt, blowing agent, and propylene-α-olefin copolymer; (B) compounding the blend at a temperature at which the copolymer is melted but neither the blowing agent nor DPO-BSA are activated, and (C) raising the temperature of the composition such that the blowing agent and DPO-BSA are activated sufficient to foam the composition.

9. The process of Claim 8 in which the blending and compounding steps are conducted at a temperature of 150°C or less, and the foaming step of (C) is conducted at a temperature above 150°C but less than 220°C.

10. Artificial leather comprising foam made by the process of Claim 9.

AMENDED CLAIMS
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1. A foamable composition comprising

(A) 5 to 95 weight percent propylene/ethylene copolymer based on the weight of the composition, the propylene/ethylene copolymer having substantially isotactic propylene sequences, a melt flow rate of 0.1 to 25 g/10 min, a molecular weight distribution of 3.5 or less,

(B) 200 to 3,000 ppm molecular melt (MM) based upon the weight of the propylene/ethylene copolymer, the molecular melt (MM) comprising 4,4'-oxydi-benzenesulfonylazide (DPO-BSA) and an antioxidant, and

(C) 1 to 30 weight percent blowing agent based upon the weight of the propylene/ethylene copolymer.

2. The foamable composition of Claim 1 in which the antioxidant is a hindered phenolic compound that does not contain phosphite containing a phosphorus atom in the +3 oxidation state, and the DPO-BSA and antioxidant are present in the molecular melt at mole ratio of 1:10 to 10:1.

3. The foamable composition of Claim 2 in which the molecular melt comprises one or more of an internal lubricant, stabilizing agent, release agent, plasticizer, ultra-violet stabilizer and catalyst neutralizer.

4. The foamable composition of the Claim 3 in which the blowing agent is azodicarbonamide.

5. A process for preparing a foam, the process comprising the steps of: (A) blending a DPO-BSA molecular melt, blowing agent, and propylene-α-olefin copolymer; (B) compounding the blend at a temperature at which the copolymer is melted but neither the blowing agent nor DPO-BSA are activated, and (C) raising the temperature of the composition such that the blowing agent and DPO-BSA are activated sufficient to foam the composition.

6. The process of Claim 5 in which the blending and compounding steps are conducted at a temperature of 150°C or less, and the foaming step of (C) is conducted at a temperature above 150°C but less than 220°C.

7. Artificial leather comprising foam made by the process of Claim 6.

CLAIMS

1. A foamable composition comprising:

(A) 5 to 95 weight percent propylene/ethylene copolymer based on the weight of the composition, the propylene/ethylene copolymer having substantially isotactic propylene sequences, a melt flow rate of 0.1 to 25 g/10 min, a molecular weight distribution of 3.5 or less,

(B) 200 to 3,000 ppm molecular melt (MM) based upon the weight of the propylene/ethylene copolymer, the molecular melt (MM) comprising 4,4′-oxydi-benzenesulfonylazide (DPO-BSA) and an antioxidant, and

(C) 1 to 30 weight percent blowing agent based upon the weight of the propylene/ethylene copolymer.

2. The foamable composition of claim 1 in which the antioxidant is a hindered phenolic compound that does not contain phosphite containing a phosphorus atom in the +3 oxidation state, and the DPO-BSA and antioxidant are present in the molecular melt at mole ratio of 1:10 to 10:1.

3. The foamable composition of claim 2 in which the molecular melt comprises one or more of an internal lubricant, stabilizing agent, release agent, plasticizer, ultra-violet stabilizer and catalyst neutralizer.

4. The foamable composition of the claim 3 in which the blowing agent is azodicarbonamide.

5. A process for preparing a foam made from the foamable composition of claim 1, the process comprising the steps of:

(A) blending a DPO-BSA molecular melt, blowing agent, and propylene/ethylene copolymer;

(B) compounding the blend at a temperature at which the copolymer is melted but neither the blowing agent nor DPO-BSA are activated, and

(C) raising the temperature of the composition such that the blowing agent and DPO-BSA are activated sufficient to foam the composition.

6. The process of claim 5 in which the blending and compounding steps are conducted at a temperature of 150° C or less, and the foaming step of (C) is conducted at a temperature above 150° C but less than 220° C.

7. Artificial leather comprising foam made by the process of claim 6.