CELLULAR POLYMERIC MATERIAL

PRIORITY CLAIM

[0001] This application claims priority under 35 U.S.C. § 119(e) to U.S. Provisional Application Serial No. 61/779,951, filed March 13, 2013, which is expressly incorporated by reference herein.

BACKGROUND

[0002] The present disclosure relates to polymeric materials that can be formed to produce a container, in particular polymeric materials that insulate. More particularly, the present disclosure relates to morphology and crystalline structure of cellular polymeric material that can be transformed into usable articles, such as insulated containers.

SUMMARY

[0003] In one aspect of the present disclosure, there is provided a process for producing an insulative cellular polypropylene-based material comprising:

extruding a formulation through extruder die lips at a die exit angle of 0° to about 60° to produce the insulative cellular polypropylene-based material,

wherein the formulation comprises

i) a first polymer material comprising at least one high melt strength polypropylene homopolymer,

ii) a second polymer material comprising at least one polymer selected from the group consisting of crystalline polypropylene homopolymer, impact polypropylene copolymer, and mixtures thereof,

iii) at least one nucleating agent, and

iv) at least one slip agent.

[0003A] In another aspect of the present disclosure, there is provided a process for producing an insulative cellular polypropylene-based material comprising:

extruding a formulation through extruder die lips to produce the insulative cellular polypropylene-based material,

wherein the formulation comprises

i) a first polymer material comprising at least one high melt strength polypropylene homopolymer,

ii) a second polymer material comprising at least one polymer selected from the group consisting of crystalline polypropylene homopolymer, impact polypropylene copolymer, and mixtures thereof,

iii) at least one nucleating agent, and

iv) at least one slip agent,

wherein cell dimensional attributes are according to $y = Ax^K$, wherein either x or y is cell density of the insulative cellular polypropylene-based material and the non-cell density variable is cell length, cell width, or cell wall thickness of the insulative cellular polypropylene-based material.

[0003B] In a further aspect of the present disclosure, there is provided an insulative cellular polypropylene-based material comprising:

i) a first polymer material comprising at least one high melt strength polypropylene homopolymer, and

ii) a second polymer material comprising at least one polymer selected from the group consisting of crystalline polypropylene homopolymer, impact polypropylene copolymer, and mixtures thereof,

wherein the material is wrinkle-resistant or crease resistant.

[0003C] Yet a further aspect of the present disclosure provides a process for producing an insulative cellular polypropylene-based material comprising:

extruding a formulation through an extruder nozzle including an inner die lip at an inner die lip angle of about 45° to about 60° and an outer die lip at an angle of about 35° degrees to about 55° to produce the insulative cellular polypropylene-based material,

wherein the formulation comprises

i) a first polymer material comprising at least one high melt strength polypropylene homopolymer,

ii) a second polymer material comprising at least one polymer selected from the group consisting of crystalline polypropylene homopolymer, impact polypropylene copolymer, and mixtures thereof,

iii) at least one nucleating agent, and

iv) at least one slip agent.

[0003D] Also disclosed herein is an insulated container in accordance with the present disclosure, which may be a drink cup or a food-storage cup (*e.g.*), is manufactured from a sheet extrudate or tubular extrudate produced in an extrusion process. In illustrative embodiments, the extrudate is a cellular polymeric material.

[0004] In illustrative embodiments, an insulative container in accordance with the present disclosure is manufactured from a tubular extrudate produced in an extrusion process. In illustrative embodiments, the extrudate is an insulative cellular polypropylene-based material configured to provide resistance to creasing and/or wrinkling during cup convolution or shaping.

[0005] In illustrative embodiments, the cell morphology of an extruded sheet of insulative cellular polypropylene-based material in accordance with the present disclosure is a function of the extrusion angle, which has an effect on the quality of an article, such as an insulative container, formed therewith. In particular, cell morphology is affected by the angle at which a polypropylene-based material in accordance with the present disclosure exits an enclosed die volume through extruder die lips, and is related to a reduction in, if not an elimination of, deep creases and/or wrinkles inside the formed article.

[0006] In illustrative embodiments, the cell morphology of an extruded sheet of insulative cellular polypropylene-based material in accordance with the present disclosure is a function of formulation and process conditions, which conditions have an effect on the quality of