## SUMMARY

**[005a]** In one aspect, the present disclosure refers to a biodegradable aqueous dispersion for coating food contact substrates, the dispersion comprising:

from 35 to 75 weight percent water;

from 25 to 65 weight percent of polyhydroxyalkanoates;

wherein the dispersion further comprises:

from 0.01 weight percent to 5.0 weight percent of at least one surfactant selected from the group consisting of polysorbates, aromatic polyethylene oxides, sorbitan derivatives, block copolymers of poly(ethylene oxide) and poly(propylene oxide), poly(glycol ethers), poly(vinyl alcohol), alkyl sulfates, alkyl phosphates, stearates, and mixtures thereof;

from 0.01 weight percent to 5.0 weight percent of at least one rheology modifier;

from 0.01 weight percent to 2.5 weight percent of at least one wetting and dispersing agent; and

from 0.01 weight percent to 0.5 weight percent of at least one biocide or biostatic agent;

wherein the dispersion is prepared by

powderizing the polyhydroxyalkanoates and dispersing the powderized polyhydroxyalkanoates in the water using a low to high shear mixer in the presence of the at least one surfactant and the at least one wetting and dispersing agent in order to create initial micelles of the polyhydroxyalkanoates,

using an ultrasonic mixer/homogenizer to finish dispersing the polyhydroxyalkanoate particles to make a homogenous dispersion, and

adding the at least one biocide or biostatic agent and the at least one rheology modifier and shear mixing to complete the dispersion.

**[005b]** In another aspect, the present disclosure refers to a biodegradable food service item comprising:

a biodegradable substrate having at least one food contact surface; and

a coating applied over the at least one food contact surface,

wherein the coating is applied as a biodegradable aqueous dispersion, comprising

from 35 to 75 weight percent water;

from 25 to 65 weight percent of polyhydroxyalkanoates;

wherein the dispersion further comprises:

from 0.01 weight percent to 5.0 weight percent of at least one surfactant selected from the group consisting of polysorbates, aromatic polyethylene oxides, sorbitan derivatives, block copolymers of poly(ethylene oxide) and poly(propylene oxide), poly(glycol ethers), poly(vinyl alcohol), alkyl sulfates, alkyl phosphates, stearates, and mixtures thereof;

from 0.01 weight percent to 5.0 weight percent of at least one rheology modifier;

from 0.01 weight percent to 2.5 weight percent of at least one wetting and dispersing agent; and

from 0.01 weight percent to 0.5 weight percent of at least one biocide or biostatic agent;

wherein the dispersion is prepared by

powderizing the polyhydroxyalkanoates and dispersing the powderized polyhydroxyalkanoates in the water using a low to high shear mixer in the presence of the at least one surfactant and the at least one wetting and dispersing agent in order to create initial micelles of the polyhydroxyalkanoates,

using an ultrasonic mixer/homogenizer to finish dispersing the polyhydroxyalkanoate particles to make a homogenous dispersion, and

adding the at least one biocide or biostatic agent and the at least one rheology modifier and shear mixing to complete the dispersion.

**[006]** The above and other needs are met by a biodegradable aqueous dispersion for coating food contact substrates. According to one example, this dispersion is

made up of from about 35 to about 75 weight percent water and from about 25 to about 65 weight percent of polyhydroxyalkanoates.

**[007]** In certain examples, the dispersion is preferably made up of from about 25 to about 65 weight percent poly-3-hydroxybutyrate-co-3-hydroxyhexanoate ("P(3HB-co-3HHx)"). Moreover, in certain examples, this P(3HB-co-3HHx) is in turn preferably made up of from about 75 to about 99 mole percent hydroxybutyrate and from about 1 to about 25 mole percent hydroxyhexanoate. More preferably, the P(3HB-co-3HHx) is made up of from about 85 to about 95 mole percent hydroxybutyrate and from about 5 to about 15 mole percent hydroxyhexanoate.

**[008]** In some examples, the dispersion is preferably made up of from about 1 to about 25 weight percent of at least one polyhydroxyalkanoate comprising from about 25 to about 50 mole percent of hydroxyvalerate, hydroxyhexanoate, hydroxyoctanoate, and/or hydroxydecanoate.

**[009]** Further, in some instances, the polyhydroxyalkanoate polymer may be a terpolymer, made up of at least three different type of hydroxyalkanoate monomer residues. The terpolymer may, for example, include from about 75 to about 99 mole percent of hydroxybutyrate, from about 0.1 to about 15 mole percent of hydroxyvalerate, and from about 1 to about 25 mole percent of a third hydroxyalkanoate, such as hydroxyhexanoate

**[010]** According to certain examples, the polyhydroxyalkanoates in the dispersion preferably have a weight average molecular weight from about 50,000 Daltons to about 2.5 million Daltons. More preferably, the weight average molecular weight is from about 150,000 Daltons to about 600,000 Daltons, and still more preferably from about 150,000 Daltons to about 500,000 Daltons.

**[011]** In certain examples, the dispersion is made up of particles preferably having an average particle size from about 10 nm to about 50 μm. Further, in some examples, the dispersion preferably has an average solids content from about 25 percent to about 65

**WHAT IS CLAIMED IS**

Claim 1. A biodegradable aqueous dispersion for coating food contact substrates, the dispersion comprising:

from 35 to 75 weight percent water;

from 25 to 65 weight percent of polyhydroxyalkanoates;

wherein the dispersion further comprises:

from 0.01 weight percent to 5.0 weight percent of at least one surfactant selected from the group consisting of polysorbates, aromatic polyethylene oxides, sorbitan derivatives, block copolymers of poly(ethylene oxide) and poly(propylene oxide), poly(glycol ethers), poly(vinyl alcohol), alkyl sulfates, alkyl phosphates, stearates, and mixtures thereof;

from 0.01 weight percent to 5.0 weight percent of at least one rheology modifier;

from 0.01 weight percent to 2.5 weight percent of at least one wetting and dispersing agent; and

from 0.01 weight percent to 0.5 weight percent of at least one biocide or biostatic agent;

wherein the dispersion is prepared by

powderizing the polyhydroxyalkanoates and dispersing the powderized polyhydroxyalkanoates in the water using a low to high shear mixer in the presence of the at least one surfactant and the at least one wetting and dispersing agent in order to create initial micelles of the polyhydroxyalkanoates,

using an ultrasonic mixer/homogenizer to finish dispersing the polyhydroxyalkanoate particles to make a homogenous dispersion, and

adding the at least one biocide or biostatic agent and the at least one rheology modifier and shear mixing to complete the dispersion.

Claim 2. The biodegradable aqueous dispersion of Claim 1, wherein the dispersion comprises from 25 to 65 weight percent poly-3-hydroxybutyrate-co-3-hydroxyhexanoate ("P(3HB-co-3HHx)").

Claim 3. The biodegradable aqueous dispersion of Claim 2, wherein the P(3HB-co-3HHx) comprises from 75 to 99 mole percent hydroxybutyrate and from 1 to 25 mole percent hydroxyhexanoate.

Claim 4. The biodegradable aqueous dispersion of Claim 1, wherein the dispersion comprises from 1 to 25 weight percent of at least one polyhydroxyalkanoate comprising from 25 to 50 mole percent of hydroxyvalerate, hydroxyhexanoate, hydroxyoctanoate, and/or hydroxydecanoate.

Claim 5. The biodegradable aqueous dispersion of Claim 1, wherein the dispersion comprises polyhydroxyalkanoates having a weight average molecular weight from 50,000 Daltons to 2.5 million Daltons.

Claim 6. The biodegradable aqueous dispersion of Claim 1, wherein the dispersion comprises particles having an average particle size from 10 nm to 50 μm.

Claim 7. The biodegradable aqueous dispersion of Claim 1, wherein the dispersion has an average solid content from 25 percent to 65 percent solids.

Claim 8. The biodegradable aqueous dispersion of Claim 1, wherein the at least one surfactant has a hydrophilic-lipophilic balance which is greater than 10.

Claim 9. The biodegradable aqueous dispersion of Claim 1, wherein the dispersion further comprises from 0.01 weight percent to 5.0 weight percent of at least one rheology modifier selected from the group consisting of polysaccharides, acrylate-based emulsion copolymers, viscosity depressants, and viscosity enhancers.

Claim 10. A biodegradable food service item comprising:

a biodegradable substrate having at least one food contact surface; and

a coating applied over the at least one food contact surface,

wherein the coating is applied as a biodegradable aqueous dispersion, comprising

from 35 to 75 weight percent water;

from 25 to 65 weight percent of polyhydroxyalkanoates;

wherein the dispersion further comprises:

from 0.01 weight percent to 5.0 weight percent of at least one surfactant selected from the group consisting of polysorbates, aromatic polyethylene oxides, sorbitan derivatives, block copolymers of poly(ethylene oxide) and poly(propylene oxide), poly(glycol ethers), poly(vinyl alcohol), alkyl sulfates, alkyl phosphates, stearates, and mixtures thereof;

from 0.01 weight percent to 5.0 weight percent of at least one rheology modifier;

from 0.01 weight percent to 2.5 weight percent of at least one wetting and dispersing agent; and

from 0.01 weight percent to 0.5 weight percent of at least one biocide or biostatic agent;

wherein the dispersion is prepared by

powderizing the polyhydroxyalkanoates and dispersing the powderized polyhydroxyalkanoates in the water using a low to high shear mixer in the presence of the at least one surfactant and the at least one wetting and dispersing agent in order to create initial micelles of the polyhydroxyalkanoates,

using an ultrasonic mixer/homogenizer to finish dispersing the polyhydroxyalkanoate particles to make a homogenous dispersion, and

adding the at least one biocide or biostatic agent and the at least one rheology modifier and shear mixing to complete the dispersion.

Claim 11. The biodegradable food service item of Claim 10, wherein the biodegradable substrate comprises a biodegradable plate, cup, bowl, fiber tray, or eating utensil.

Claim 12. The biodegradable food service item of Claim 10, wherein the coating is applied over the at least one food contact surface at a coating weight, on a dry basis, from 2 to 25 grams per square meter.

Claim 13. The biodegradable food service item of Claim 10, wherein the coating exhibits a Cobb water absorption value, measured according to TAPPI Standard T441, of less than 20 grams per square meter.

Claim 14. The biodegradable food service item of Claim 10, wherein the coating exhibits Kit Test grease resistance value, measured according to TAPPI Standard T559 cm-12, of greater than Kit Value 5.