SUMMARY

[006A] In one aspect, the present disclosure refers to a hot melt adhesive comprising:

from about 10 to about 20 weight percent of a lactic acid oligomer or polymer having a weight average molecular weight from about 1500 to about 3000;

from about 40 to about 75 weight percent of polylactide having a weight average molecular weight from about 10,000 to about 18,000;

from about 20 to about 35 weight percent of a polyester formed from the copolymerization of one or more diols and one or more dicarboxylic acids; and

from about 0.5 to about 5 weight percent of a copolymer of vinyl acetate and a mono-unsaturated short chain fatty acid, the fatty acid having from 4 to 12 carbon atoms,

wherein all weight percentages are based on the overall weight of the hot melt adhesive.

[006B] In another aspect, the present disclosure refers to an adhesive-coated substrate comprising:

a substrate having at least a first side; and

a hot melt adhesive coating applied to at least of portion of the substrate first side, wherein the hot melt adhesive coating comprises

from about 10 to about 20 weight percent of a lactic acid oligomer or polymer having a weight average molecular weight from about 1500 to about 3000,

from about 40 to about 75 weight percent of polylactide having a weight average molecular weight from about 10,000 to about 18,000,

from about 20 to about 35 weight percent of a polyester formed from the copolymerization of one or more diols and one or more dicarboxylic acids, and

from about 0.5 to about 5 weight percent of a copolymer of vinyl acetate and a mono-unsaturated short chain fatty acid, the fatty acid having from 4 to 12 carbon atoms,

wherein all weight percentages are based on the overall weight of the hot melt adhesive.

[006C] In a further aspect, the present disclosure refers to a method for making a hot melt adhesive, comprising the steps of:

melt blending, at a temperature from about 140 to about 175 °C, a mixture which comprises

from about 10 to about 20 weight percent of a lactic acid oligomer or polymer having a weight average molecular weight from about 1500 to about 3000,

from about 40 to about 75 weight percent of polylactide having a weight average molecular weight from about 10,000 to about 18,000,

from about 20 to about 35 weight percent of a polyester formed from the copolymerization of one or more diols and one or more dicarboxylic acids, and

from about 0.5 to about 5 weight percent of a copolymer of vinyl acetate and a mono-unsaturated short chain fatty acid, the fatty acid having from 4 to 12 carbon atoms; and

further blending the mixture with from about 1 to about 5 weight percent of a carboxylic acid or a carboxylic acid derivative, at a temperature at a temperature from about 140 to about 175 °C to provide a stabilized hot melt adhesive,

wherein all weight percentages are based on the overall weight of the hot melt adhesive.

[007] The present disclosure provides a hot melt adhesive composition. According to one example, the hot melt adhesive includes at least the following components: (1) from about 10 to about 20 weight percent of a lactic acid oligomer or polymer having a weight average molecular weight from about 1500 to about 3000; (2) from about 40 to about 75 weight percent of polylactide having a weight average molecular weight from about 10,000 to about 18,000; (3) from about 20 to about 35 weight percent of a polyester formed from the copolymerization of one or more diols and one or more dicarboxylic acids; and (4) from about 0.5 to about 5 weight percent of a copolymer of vinyl acetate and a mono-unsaturated short chain fatty acid, the fatty acid having from 4 to 12 carbon atoms, All of the aforementioned weight percentages are based on the overall weight of the hot melt adhesive composition.

[008] In certain examples of the present disclosure, the hot melt adhesive preferably has a viscosity from about 1000 centipoise to about 6000 centipoise at a

temperature of about 143°C. More preferably, the hot melt adhesive has a viscosity from about 2000 centipoise to about 4000 centipoise at a temperature of about 143°C, and most preferably a viscosity from about 2000 centipoise to about 3000 centipoise at a temperature of about 143°C.

[009] In certain examples of the present disclosure, the lactic acid oligomer or polymer preferably has a viscosity from about 350 centipoise to about 450 centipoise at a temperature of about 280°C.

[010] In some examples of the present disclosure, the polylactide preferably has a viscosity from about 1800 centipoise to about 2200 centipoise at a temperature of about 143°C.

[011] In some examples of the present disclosure, the polylactide also includes a polymer capping group formed by reaction of the polylactide with a carboxylic acid or a carboxylic acid derivative. More preferably, the polymer capping groups is form by

reaction of the polylactide with an acid anhydride. Most preferably, the acid anhydride is propionic anhydride.

[012] In one example of the present disclosure, the polyester preferably has a viscosity from about 15,000 centipoise to about 35,000 centipoise at a temperature of about 216°C. In certain examples of the present disclosure, the polyester also preferably has a weight average molecular weight from about 55,000 to about 72,000.

[013] In some examples of the present disclosure, the polyester also includes a polymer capping group formed by reaction of the polyester with a carboxylic acid or a carboxylic acid derivative. More preferably, the polymer capping groups is form by reaction of the polyester with an acid anhydride. Most preferably, the acid anhydride is propionic anhydride.

[014] In some examples of the present disclosure, the polyester is polybutylene(succinate-co-adipate) ("PBSA"). In certain embodiments of the present disclosure, the one or more dicarboxylic acids in the PBSA preferably include from about 10 to about 30 mole percent adipic acid and from about 70 to about 90 mole percent succinic acid.

[015] In some examples of the present disclosure, the mono-unsaturated short chain fatty acid is preferably crotonic acid.

[016] In another example, the present disclosure provides an adhesive-coated substrate. According to one example, the adhesive-coated substrate includes a substrate having at least a first side; and a hot melt adhesive coating applied to at least of portion of the substrate first side. The hot melt adhesive includes at least the following components: (1) from about 10 to about 20 weight percent of a lactic acid oligomer or polymer having a weight average molecular weight from about 1500 to about 3000; (2) from about 40 to about 75 weight percent of polylactide having a weight average molecular weight from about 10,000 to about 18,000; (3) from about 20 to about 35 weight percent of a polyester formed from the copolymerization of one or more diols and one or more dicarboxylic acids; and (4) from about 0.5 to about 5 weight percent of a copolymer of vinyl acetate

and a mono-unsaturated short chain fatty acid, the fatty acid having from 4 to 12 carbon atoms. All of the aforementioned weight percentages are based on the overall weight of the hot melt adhesive composition.

[017] In yet another example, the present disclosure provides a method for making a hot melt adhesive. According to one example, the method includes the a first step of melt blending, at a temperature from about 140 to about 175 °C, a mixture which includes at least the following components: (1) from about 10 to about 20 weight percent of a lactic acid oligomer or polymer having a weight average molecular weight from about 1500 to about 3000; (2) from about 40 to about 75 weight percent of polylactide having a weight average molecular weight from about 10,000 to about 18,000; (3) from about 20 to about 35 weight percent of a polyester formed from the copolymerization of one or more diols and one or more dicarboxylic acids; and (4) from about 0.5 to about 5 weight percent of a copolymer of vinyl acetate and a mono-unsaturated short chain fatty acid, the fatty acid having from 4 to 12 carbon atoms.

[018] The method also includes a second step of further blending the mixture with from about 1 to about 5 weight percent of a carboxylic acid or a carboxylic acid derivative, at a temperature at a temperature from about 140 to about 175 °C to provide a stabilized hot melt adhesive. All of the aforementioned weight percentages are based on the overall weight of the hot melt adhesive.