SUMMARY OF THE INVENTION

[0013] The present disclosure is directed to plasticizer compositions for reduced plasticizer extraction from plasticized halogenated polymers comprising (i) an epoxidized fatty acid mono-ester and (ii) an epoxy-ester. In certain embodiments, the plasticizer compositions of the present disclosure are substantially free of compatibilizers. In some embodiments still, the plasticizer compositions of the present disclosure further comprise a metal perchlorate and/or antioxidant. In one aspect, the present disclosure is directed to a plasticizer composition comprising: (a) an epoxidized fatty acid mono-ester selected from epoxidized 2-ethylhexyl tallate, epoxidized 2-ethyhexyl soyate, epoxidized octyl tallate, epoxidized octyl soyate, epoxidized octyl oleate, epoxidized methyl soyate or mixtures of any two thereof, (b) an epoxy-ester selected from epoxidized soybean oil, epoxidized linseed oil, and mixtures of any two or more thereof; the epoxidized fatty acid mono-esters and epoxy-esters being substantially free of mono- and/or diglycerides, and a ratio of epoxy esters to epoxidized fatty acid mono-esters is in the range of 10 to 90 weight percent, based on the total weight of the epoxidized fatty acid mono-ester and epoxy ester; and (c) a metal perchlorate selected from sodium or potassium perchlorate.

[0013a] In another aspect, the present disclosure is directed to a plasticized halogenated polymer composition comprising a halogenated polymer and the plasticizer composition as disclosed herein. In another aspect, the present disclosure is directed to a PVC article comprising the plasticizer composition as disclosed herein.

[0014] The present disclosure is also directed to a process for preparing plasticizer compositions for reduced plasticizer extraction from plasticized halogenated polymers comprising the steps of: providing an epoxidized fatty acid mono-ester; and blending said epoxidized fatty acid mono-ester with an epoxy-ester for a predetermined amount of time at ambient temperature to attain a homogeneous liquid blend.

[0015] The present disclosure further provides a process for making a plasticized halogenated polymer composition comprising the steps of (i) providing an epoxidized fatty acid mono-ester, (ii) blending said epoxidized fatty acid mono-ester with an epoxy-ester for a predetermined amount of time at ambient temperature to attain a homogeneous liquid blend, and (iii) adding said homogeneous liquid blend to a halogenated polymer.

[0016] The present disclosure is further directed to a plasticized polyvinyl chloride composition for reduced plasticizer extraction prepared by a process comprising the steps of (i) providing an epoxidized fatty acid mono-ester, (ii) blending said

epoxidized fatty acid mono-ester with an epoxy-ester for a predetermined amount of time at ambient temperature to attain a homogeneous liquid blend, and (iii) adding said homogeneous liquid blend to polyvinyl chloride in an amount of from 1 to 200 parts per 100 parts of polyvinyl chloride, at a temperature in the range of from 10–300 °C.

[0017] The present disclosure also provides a plasticizer composition comprising (i) an epoxidized fatty acid mono-ester and (ii) an epoxy-ester, wherein the epoxidized fatty acid mono-ester comprises fatty acid derived from tall oil or soybean oil; and wherein the fatty acid derived from tall oil or soybean oil is substantially fully esterified with monohydric alcohol having at least three carbon atoms.

[0018] The present disclosure is also directed to a plasticizer composition comprising at least one epoxidized fatty acid mono-ester and at least one conventional co-plasticizer ester.

[0019] The present disclosure is further directed to a plasticizer composition comprising: an epoxidized fatty acid mono-ester, an epoxy-ester, and a metal perchlorate and/or antioxidant.

What is claimed is:

1. A plasticizer composition comprising:

(a) an epoxidized fatty acid mono-ester selected from epoxidized 2-ethylhexyl tallate, epoxidized 2-ethyhexyl soyate, epoxidized octyl tallate, epoxidized octyl soyate, epoxidized octyl oleate, epoxidized methyl soyate or mixtures of any two thereof,

(b) an epoxy-ester selected from epoxidized soybean oil, epoxidized linseed oil, and mixtures of any two or more thereof;

the epoxidized fatty acid mono-esters and epoxy-esters being substantially free of mono- and/or diglycerides, and a ratio of epoxy esters to epoxidized fatty acid mono-esters is in the range of 10 to 90 weight percent, based on the total weight of the epoxidized fatty acid mono-ester and epoxy ester; and

(c) a metal perchlorate selected from sodium or potassium perchlorate.

2. The plasticizer composition of claim 1, further comprising a conventional plasticizer, selected from phthalates, hydrogenated phthalates, aliphatic esters of dicarboxylic acids, polymeric esters of dicarboxylic acids, citrates, sucrose esters, levulinic ketal esters, phosphates, alkyl phenol sulfonates, pyrrolidones, or mixtures thereof, wherein the epoxidized fatty acid mono-ester and conventional plasticizer are present in an amount such that the weight ratio of epoxidized fatty acid mono-ester to conventional plasticizer is from 1:5 to 3:1.
3. The plasticizer composition of claim 1 wherein the epoxy-ester is epoxidized soybean oil.
4. The plasticizer composition of Claim 3, wherein the epoxidized fatty acid mono-ester is epoxidized 2-ethylhexyl tallate.
5. The plasticizer composition of claim 3 wherein the epoxidized fatty acid mono-ester is epoxidized 2-ethylhexyl soyate.
6. The plasticizer composition of any one of claims 1 and 2 further comprising an antioxidant selected from pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate),

octadecyl-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate or 2,2'-methylene-bis(6-t-butyl-4-methylphenol).

7. The plasticizer composition of Claim 1, wherein the metal perchlorate is sodium perchlorate.

8. A plasticized halogenated polymer composition comprising a halogenated polymer and the plasticizer composition according to any one of Claims 1-7.

9. The composition of Claim 8, wherein the halogenated polymer is PVC.

10. A PVC article comprising the plasticizer composition according to any one of Claims 1-7.

11. The PVC article of Claim 10, further comprising flexible PVC.