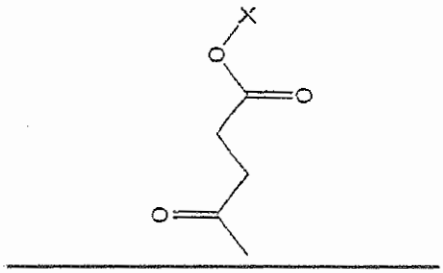
wherein R^1 and R^2 are independently a C_1-C_{10} linear or branched alkyl or alkoxyalkyl. In some embodiments, R^1 and R^2 can be methyl, ethyl, n-butyl, isobutyl, isoamyl, or 2-ethylhexyl.

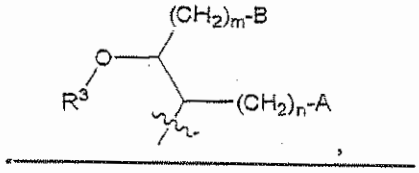
The compounds can also be used as a plasticizer with a base polymer in a plasticized polymer composition. A base polymer can include vinyl chloride polymers, poly(3-hydroxyalkanoates), poly(lactates), and polysaccharide polymers.

In one aspect, there is provided a compound having the formula:



wherein:

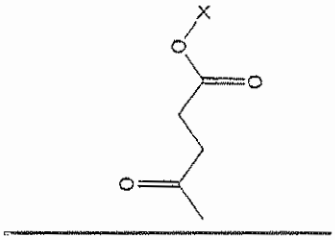
X is



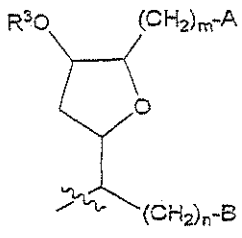
wherein:

R^3 is a C_1-C_{10} linear or branched alkyl or alkoxyalkyl;
one of A or B is hydrogen and the other is an esterified carboxy group; and
m and n are independently integers from 0 to 20, wherein the sum of m+n is in the range from 8 to 21.

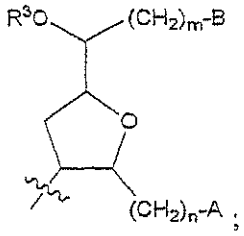
In another aspect, there is provided a compound having the formula:



wherein X is selected from the following:



and



;

wherein:

R^3 is a C_1-C_{10} linear or branched alkyl or alkoxyalkyl;
one of A or B is hydrogen and the other is an esterified carboxy group; and
m and n are independently integers from 0 to 20, wherein the sum of m+n is in the range from 8 to 21.

In another aspect, there is provided a method for preparing a compound as defined above, the method comprising:

a) providing an epoxidized fatty acid ester derivative and one or more of levulinate ester, levulinic acid and angelicalactone;

b) effecting the reaction between the compounds of a) in the presence of an acid catalyst, wherein the reaction results in the formation of a compound as defined above, or mixtures thereof.

In another aspect, there is provided a method for preparing a compound as defined above, the method comprising:

a) providing an epoxidized fatty acid ester derivative and one or more of levulinate ester, levulinic acid and angelicalactone;

b) effecting the reaction between the compounds of a) in the presence of an acid catalyst, wherein the reaction results in the formation of a compound as defined above, or mixtures thereof.

In another aspect, there is provided a plasticized polymer composition comprising:

a) a base polymer; and

b) a compound as defined above.

The details of one or more embodiments of the ~~invention~~disclosure are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the ~~invention~~disclosure will be apparent from the description and drawing, and from the claims.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. 1 demonstrates a representative EI mass-spectra of compounds (4) (FIG. 1A) and (11) (FIG. 1B), obtained in the course of GC-MS analysis, per Example 6. (Electron ionization at 70 eV).

FIG. 2A is a representative EI mass-spectra of compounds (4) (FIG $2A_1$) and (11) (FIG. $2A_2$), obtained in the course of GC-MS analysis, per Example 7 (Sample B).

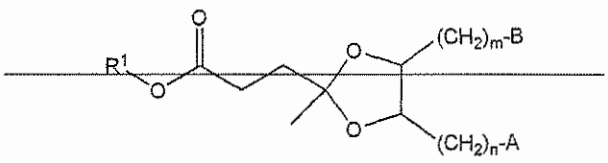
FIG. 2B is a representative IE mass-spectrum of mixture of isomers of epoxy ketal compound (13a) and (13b) (Sample A, Example 7).

FIG. 3 shows a representative IE mass-spectrum of mixture of isomers of monoketal compound (4) wherein $R^1 = R^2$ = ethyl (Example 24) (FIG. 3A), and a representative IE mass-spectrum of mixture of isomers of diketal compound (11) wherein $R^1 = R^2$ = ethyl (Example 24) (FIG. 3B).

FIG. 4 is a representative IE mass-spectrum of mixture of isomers of monoketal compound (4) wherein $R^1 = R^2$ = n-butyl (Example 25) (FIG. 4A), and a representative IE mass-spectrum of mixture of isomers of diketal compound (FIG. 4B) wherein $R^1 = R^2$ = n-butyl (Example 25).

WHAT IS CLAIMED IS:

~~1. A compound having the formula:~~



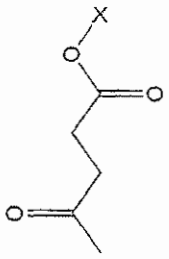
~~wherein:~~

~~R^1 is a C_1-C_{10} linear or branched alkyl or alkoxyalkyl;~~

~~one of A or B is hydrogen and the other is an esterified carboxy group; and~~

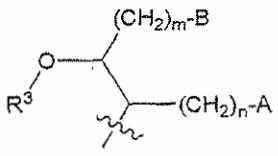
~~m and n are independently integers from 0 to 20, wherein the sum of m+n is in the range from 8 to 21.~~

~~2~~1. A compound having the formula:



wherein:

X is

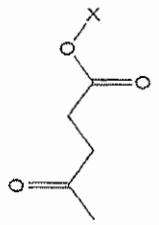


,

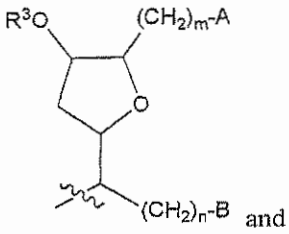
wherein:

R^3 is a C_1-C_{10} linear or branched alkyl or alkoxyalkyl;
one of A or B is hydrogen and the other is an esterified carboxy group; and
m and n are independently integers from 0 to 20, wherein the sum of m+n is in the range from 8 to 21.

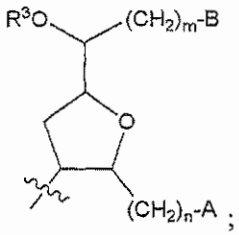
~~32~~. A compound having the formula:



wherein X is selected from the following:



and

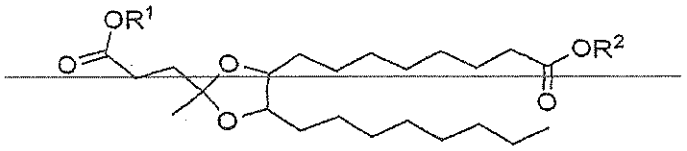


;

wherein:

R^3 is a C_1-C_{10} linear or branched alkyl or alkoxyalkyl;
one of A or B is hydrogen and the other is an esterified carboxy group; and
m and n are independently integers from 0 to 20, wherein the sum of m+n is in the range from 8 to 21.

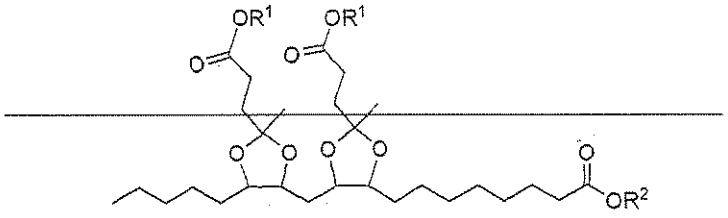
~~4. A compound having the formula~~



~~wherein:~~

~~R^1 and R^2 are independently a C_1-C_{10} linear or branched alkyl or alkoxyalkyl.~~

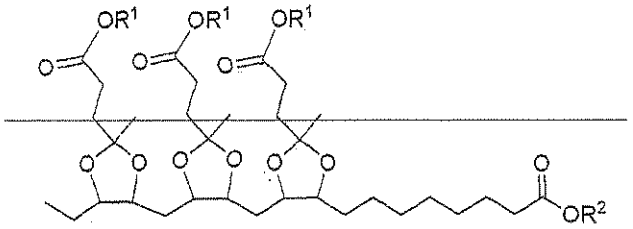
~~5. A compound having the formula:~~



~~wherein:~~

~~R^1 and R^2 are independently a C_1-C_{10} linear or branched alkyl or alkoxyalkyl.~~

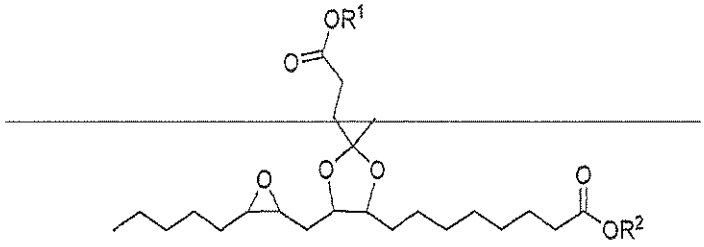
~~6. A compound having the formula:~~



~~wherein:~~

~~R^1 and R^2 are independently a C_1-C_{10} linear or branched alkyl or alkoxyalkyl.~~

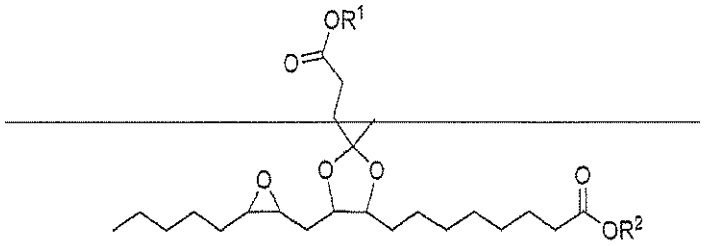
~~7. A compound having the formula:~~



~~wherein:~~

~~R^1 and R^2 are independently a C_1-C_{10} linear or branched alkyl or alkoxyalkyl.~~

~~8. A compound having the formula:~~



~~wherein:~~

~~R^1 and R^2 are independently a C_1-C_{10} linear or branched alkyl or alkoxyalkyl.~~

~~9. The compound of any one of claims 4-8, wherein R^1 and R^2 are independently selected from the group consisting of methyl, ethyl, n-butyl, isobutyl, isoamyl, and 2-ethylhexyl.~~

~~10. The compound of claim 9, wherein R^1 and R^2 are independently selected from the group consisting of methyl, ethyl, and n-butyl.~~

~~11~~3. A method for preparing a compound of ~~any one of~~ claims ~~1-8~~, ~~or mixtures thereof,~~ the method comprising:

a) providing an epoxidized fatty acid ester derivative and one or more of levulinate ester, levulinic acid and angelicalactone;

b) effecting the reaction between the compounds of a) in the presence of an acid catalyst, wherein the reaction results in the formation of a compound of claim 1-~~8~~2, or mixtures thereof.

4. A method for preparing a compound of claim 2, the method comprising:

a) providing an epoxidized fatty acid ester derivative and one or more of levulinate ester, levulinic acid and angelicalactone;

b) effecting the reaction between the compounds of a) in the presence of an acid catalyst, wherein the reaction results in the formation of a compound of claim 1-2, or mixtures thereof.

~~1~~25. A plasticized polymer composition comprising:

a) a base polymer; and
b) a compound of ~~any one of~~ claims 1-~~8~~.

~~1~~36. The plasticized polymer composition of claim ~~1~~25, wherein the base polymer is selected from the group consisting of a vinyl chloride polymer, a poly(3- hydroxylalkanoate) polymer, and a polysaccharide polymer.

~~1~~47. The plasticized polymer composition of claim ~~1~~36, wherein the base polymer is vinyl chloride polymer.

8. A plasticized polymer composition comprising:

a) a base polymer; and
b) a compound of claim 2.

9. The plasticized polymer composition of claim 8, wherein the base polymer is selected from the group consisting of a vinyl chloride polymer, a poly(3- hydroxylalkanoate) polymer, and a polysaccharide polymer.

10. The plasticized polymer composition of claim 9, wherein the base polymer is vinyl chloride polymer.