ABSTRACT OF THE DISCLOSURE

The present invention relates to functional fluid compositions containing friction modifiers, and specifically stable compositions containing friction modifiers with limited solubility in and/or limited compatibility with the functional fluids with which they are used. In particular the present invention deals with functional fluids used in internal combustion engines, such as engine oils, and friction modifiers derived from hydroxy-carboxylic acids, where the friction modifier is present in the functional fluid composition at levels that would otherwise cause the composition to be unstable and/or hazy.

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We claim:

1. A composition comprising:

(a) a medium comprising a solvent, a functional fluid, an additive concentrate, or combinations thereof; and

(b) a friction modifier component comprising a derivative of a hydroxycarboxylic acid that is not fully soluble in the medium; and

(c) a stabilizing component comprising a phosphorus containing additive that is soluble in (a) and that interacts with (b) such that the solubility of (b) in (a) is improved;

wherein components (b) is present in component (a) in the form of dispersed particles wherein no more than 10 percent by weight of the particles have a diameter of more than 0.5 microns

wherein component (b) is present in the overall composition at a level of no less than 0.15 percent by weight.

2. The composition of claim 1 wherein the phosphorus containing additive of component (c) comprises a phosphate, a phosphite, a thiophosphate, a salt of any of these materials, or any combination thereof.

3. The composition of claim 1 wherein the phosphorus containing additive of component (c) comprises: (i) a hydrocarbyl phosphoric acid or acid ester; (ii) a salt thereof; or combinations thereof.

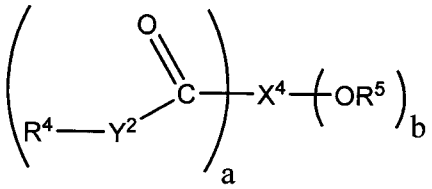
4. The composition of claim 1 claim 1 wherein the phosphorus containing additive of component (c) comprises a compound represent by the following formula:

$$(X^1=)_aP(X^2{}_b\text{-}R)_3$$

or a salted version thereof wherein: each X^1 is independently O or S, a is 0 or 1, each X^2 is independently O or S, b is 0 or 1, and R is H or a hydrocarbyl group.

5. The composition of any of the claims 1 to 4 wherein the turbidity of the overall composition is improved, as defined by a lower JTU and/or NTU value compared to the same composition that does not contain (c), the stabilizing component.

6. The composition of any of the claims 1 to 4 wherein (b), the friction modifier component, comprises a compound derived from a hydroxy-carboxylic acid represented by the formula:



wherein: a and b may be independently integers of 1 to 5; X^4 may be an aliphatic or alicyclic group, or an aliphatic or alicyclic group containing an oxygen atom in the carbon chain, or a substituted group of the foregoing types, said group containing up to 6 carbon atoms and having a+b available points of attachment; each Y^2 may be independently –O–, >NH, or >NR^6 or two Ys together representing the nitrogen of an imide structure R^4-N< formed between two carbonyl groups; and each R^4 and R^6 may be independently hydrogen or a hydrocarbyl group, provided that at least one R^4 and R^6 group may be a hydrocarbyl group; each R^5 may be independently hydrogen, a hydrocarbyl group or an acyl group, further provided that at least one -OR^5 group is located on a carbon atom within X^4 that is α or β to at least one of the -C(O)-Y^2-R^1 groups and further provided that at least one R^5 is hydrogen.

7. The composition of any of the claims 1 to 6 wherein the friction modifier further comprises an amide of an aliphatic carboxylic acid, said carboxylic acid containing 6 to 28 carbon atoms.

8. The composition of any of the claims 1 to 7 wherein the friction modifier further comprises an amide of an aliphatic carboxylic acid where the carboxylic acid comprises stearic acid, oleic acid, or combinations thereof.

9. The composition of any of the claims 1 to 8 wherein the concentration of component (b) in the overall composition is at least 0.5 percent by weight.

10. A process of preparing a clear and stable composition comprising:

(a) a medium comprising a solvent, a functional fluid, an additive concentrate, or combinations thereof; and

(b) a friction modifier component comprising a derivative of a hydroxycarboxylic acid that is not fully soluble in the medium; and

(c) a stabilizing component comprising a phosphorus containing additive that is soluble in (a) and that interacts with (b) such that (b)'s solubility in (a) is improved;

said method comprising the steps of:

I. adding components (b) and (c) to component (a) wherein component (b) is present in the overall composition at a level of no less than 0.15 percent by weight;

II. mixing the components so that particles of components (b) are present in component (a) in the form of dispersed particles wherein no more than 10 percent by weight of the particles have a diameter of more than 0.5 microns.

11. The process of claim 10 wherein the clarity of the resulting mixture is improved, as defined by a lower JTU and/or NTU value compared to the same composition that does not contain (c), the stabilizing component.

12. The process of any of the claims 10 to 11 wherein component (c), the stabilizing component, comprises: (i) a hydrocarbyl phosphoric acid or acid ester; (ii) an amine salt thereof; or combinations thereof.

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