CLAIMS

WHAT IS CLAIMED IS

1. A corrosion inhibitor made by a process comprising:

(a) reacting a 1,3,4-dimercapto thiadiazole or alkali metal salt thereof with an alkyl mercaptan in the presence of an acid to form a first reaction intermediate;

(b) reacting the first reaction intermediate with hydrogen peroxide to form the corrosion inhibitor; and

(c) wherein the 1,3,4-dimercapto thiadiazole or alkali metal salt thereof, the alkyl mercaptan, and the hydrogen peroxide are provided at a molar ratio of 1 : 1.95 - 2.15 : 2.1 - 2.4.

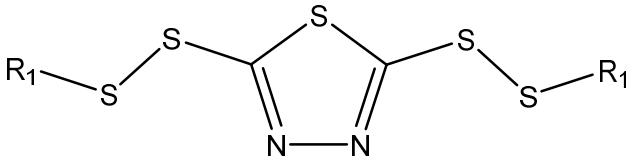
2. The corrosion inhibitor of claim 1, wherein the acid is a strong acid provided in molar excess to the 1,3,4-dimercapto thiadiazole.

3. The corrosion inhibitor of claim 1, wherein the corrosion inhibitor is about 95 mol percent or more of a 2,5-dialkyl-dithiothiadiazole compound and about 5 mol percent or less of a monoalkyl-dithiothiadiazole compound.

4. The corrosion inhibitor of claim 1, wherein the corrosion inhibitor has a total acid number of 10 or less.

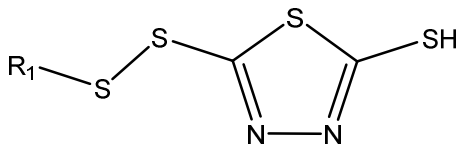
5. The corrosion inhibitor of claim 1, wherein the process further includes heating the corrosion inhibitor to a temperature effective to separate any aqueous layer and optionally subjecting the heated corrosion inhibitor to a vacuum strip.

6. The corrosion inhibitor of claim 3, wherein the 2,5-dialkyl-dithiothiadiazole compound has the structure of Formula Ia:



(Formula Ia) and

wherein the monoalkyl-dithiothiadiazole compound has the structure of Formula Ib:



(Formula Ib)

wherein each R_1 of Formula Ia and/or Formula Ib is independently a linear or branched C4 to C20 hydrocarbyl group.

7. The corrosion inhibitor of claim 1, wherein the alkyl moiety of the alkyl mercaptan is an aliphatic or aromatic hydrocarbyl group.

8. The corrosion inhibitor of claim 7, wherein the alkyl moiety of the alkyl mercaptan is a linear or branched C1 to C30 hydrocarbyl group.

9. A lubricant comprising:

(a) a majority of base oil; and

(b) a corrosion inhibitor made by a process comprising:

(i) reacting a 1,3,4-dimercapto thiadiazole or alkali metal salt thereof with an alkyl mercaptan in the presence of an acid to form a first reaction intermediate;

(ii) reacting the first reaction intermediate with hydrogen peroxide to form the corrosion inhibitor; and

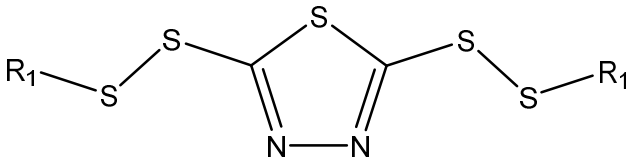
(iii) wherein the 1,3,4-dimercapto thiadiazole or alkali metal salt thereof, the alkyl mercaptan, and the hydrogen peroxide are provided at a molar ratio of 1 : 1.95 - 2.15 : 2.1 – 2.4.

10. The lubricant of claim 9, wherein the acid is a strong acid provided in molar excess to the 1,3,4-dimercapto thiadiazole.

11. The lubricant of claim 9, further comprising one or more phosphonate ester compounds including, based on the total weight percent of phosphonate ester compounds, about 90 weight percent or more of a phosphonate diester and no more than about 10 weight percent of a phosphonate monoester.

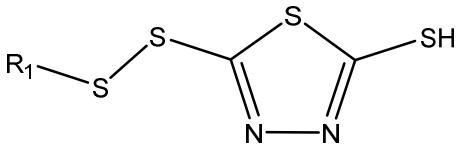
12. The lubricant of claim 9, wherein the corrosion inhibitor is about 95 mol percent or more of a 2,5-dialkyl-dithiothiadiazole compound and about 5 mol percent or less of a monoalkyl-dithiothiadiazole compound.

13. The lubricant of claim 12, wherein the 2,5-dialkyl-dithiothiadiazole compound has the structure of Formula Ia:



(Formula Ia) and

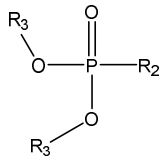
wherein the monoalkyl-dithiothiadiazole compound has the structure of Formula Ib:



(Formula Ib)

wherein each R_1 of Formula Ia and/or Formula Ib is, independently, a linear or branched C4 to C20 hydrocarbyl group.

14. The lubricant of claim 11, wherein the phosphonate diester has a structure of Formula II

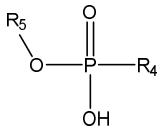


(Formula II)

wherein R_2 is a C_1 to C_{50} hydrocarbyl group and each R_3 is, independently, a C_1 to C_{20} alkyl group.

15. The lubricant of claim 14, wherein the phosphonate diester is dimethyl octadecyl phosphonate.

16. The lubricant of claim 11, wherein the phosphonate monoester has a structure of Formula III



(Formula III)

wherein R_4 is a C_1 to C_{50} hydrocarbyl group and R_5 is a C_1 to C_{20} alkyl group.

17. The lubricant of claim 16, wherein the phosphonate monoester is methyl octadecyl phosphonate.

18. The lubricant of claim 9, wherein the process further includes heating the corrosion inhibitor to a temperature effective to separate any aqueous layer and optionally subjecting the heated corrosion inhibitor to a vacuum strip.

19. The lubricant of claim 9, wherein the lubricant exhibits a FAG FE8 roller bearing weight loss of about 12 mg of less pursuant to DIN 51819-3 after 80 hours of runtime at 80°C, 7.5 rpm, and 100 kN.

20. A corrosion inhibitor additive comprising:

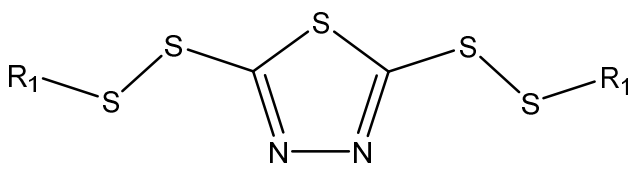
(a) about 95 mol percent or more of a 2,5-dialkyl-dithiothiadiazole compound;

(b) a monoalkyl-dithiothiadiazole compound, but no more than about 5 percent of the monoalkyl-dithiothiadaizole compound; and

(c) wherein the total acid number of the corrosion inhibitor additive is about 10 or less; and

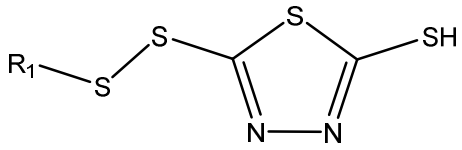
wherein the corrosion inhibitor is obtained from a dimercapto thiadiazole or alkali metal salt thereof, an alkyl mercaptan, and a hydrogen peroxide provided at a molar ratio of 1 : 1.95 - 2.15 : 2.1 - 2.4.

21. The corrosion inhibitor of claim 20, wherein the 2,5-dialkyl-dithiothiadiazole compound has the structure of Formula Ia:



(Formula Ia) and

wherein the monoalkyl-dithiothiadiazole compound has the structure of Formula Ib:



(Formula Ib)

wherein each R_1 of Formula Ia and/or Formula Ib is independently a linear or branched C4 to C20 hydrocarbyl group.