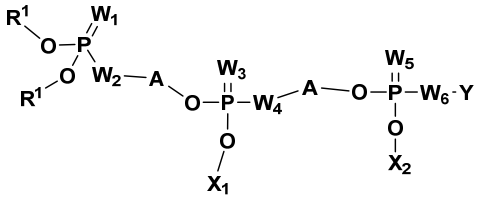
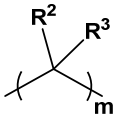
## CLAIMS

1. A compound of formula (I)



(I),

or a tribologically acceptable salt thereof,

wherein A is:  ;

each $R^1$ is the same or different and is independently selected from alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl ;

each $R^2$ and $R^3$ are independently selected from H, alkyl, alkenyl, cycloalkyl and cycloalkylalkyl;

Y is selected from the group consisting of alkyl, alkoxyalkyl, benzyl, and $–R^4\text{-}R^5\text{-}R^6$;

$R^4$ is alkylene;

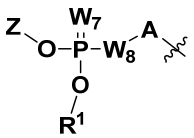
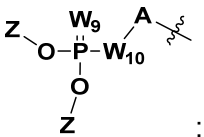
$R^5$ is selected from the group consisting of a bond, alkylene; -C(O)- and $-C(R^7)-$;

$R^6$ is selected from the group consisting of alkyl, hydroxyalkyl, hydroxyalkyleneoxy, hydroxy and alkoxy;

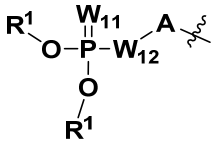
$R^7$ is hydroxy;

m is an integer from 2 to 8;

$X_1$ is $R^8$ or Z;

$X_2$ is selected from the group consisting of $R^8$,  , and  ;

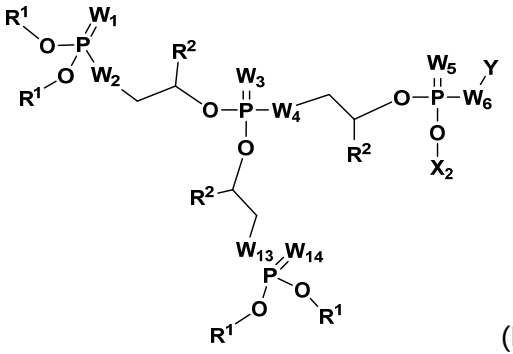
$R^8$ is alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl; and

Z is  ,

wherein when $X_2$ is $R^8$, $X_1$ is Z; and

wherein $W_1$-$W_{12}$ are each independently O or S, and at least one of $W_1$-$W_{12}$ is O.

2. The compound of claim 1, wherein the compound is a compound of formula (Ia)



(Ia)

or a tribologically acceptable salt thereof,

each $R^1$ is the same or different and is independently selected from alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl;

each $R^2$ is independently selected from alkyl, alkenyl, cycloalkyl and cycloalkylalkyl;

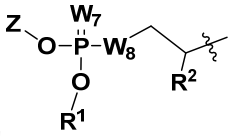
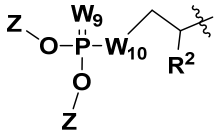
Y is selected from the group consisting of alkyl, alkoxyalkyl, benzyl, and $–R^4$-$R^5$-$R^6$;

$R^4$ is alkylene;

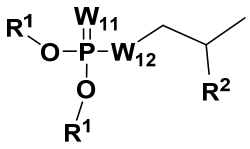
$R^5$ is selected from the group consisting of a bond, alkylene; -C(O)- and -C($R^7$)-;

$R^6$ is selected from the group consisting of alkyl, hydroxyalkyl, hydroxyalkyleneoxy, hydroxy and alkoxy;

$R^7$ is hydroxy;

$X_2$ is selected from the group consisting of $R^8$, , and ;

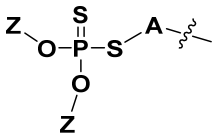
$R^8$ is alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl;

Z is ; and

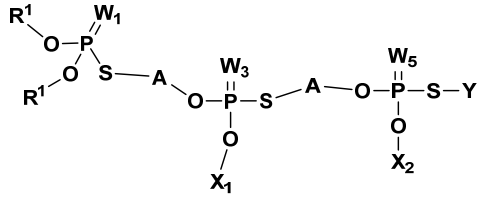
$W_1$-$W_{14}$ are each independently O or S, and at least one of $W_1$-$W_{14}$ is O.

3. The compound of claim 1 or 2, wherein each $R^1$ is the same or different and is independently selected from $C_1$-$C_{30}$alkyl, $C_2$-$C_{30}$alkenyl, cycloalkyl, cycloalkylalkyl, aryl and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from $C_1$-$C_{10}$alkyl and $C_2$-$C_{10}$alkenyl.

4. The compound of claim 1 wherein $R^2$ is $C_1$-$C_{10}$alkyl.

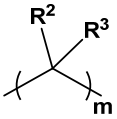
5. The compound of claim 1, wherein $X_2$ is  or $R^8$.

6. The compound of claim 1, wherein the compound is a compound of formula (II)



(II),

or a tribologically acceptable salt thereof,

wherein A is:  ;

each $R^1$ is the same or different and is independently selected from alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl ;

each $R^2$ and $R^3$ are independently selected from H, alkyl, alkenyl, cycloalkyl and cycloalkylalkyl;

Y is selected from the group consisting of alkyl, alkoxyalkyl, benzyl, and $–R^4\text{-}R^5\text{-}R^6$;

$R^4$ is alkylene;

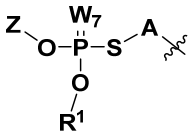
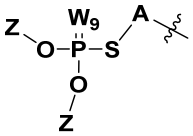
$R^5$ is selected from the group consisting of a bond, alkylene; -C(O)- and $-C(R^7)-$;

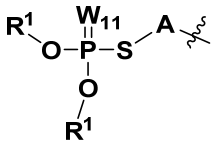
$R^6$ is selected from the group consisting of alkyl, hydroxyalkyl, hydroxyalkyleneoxy, hydroxy and alkoxy;

$R^7$ is hydroxy;

m is an integer from 2 to 8;

$X_1$ is $R^8$ or Z;

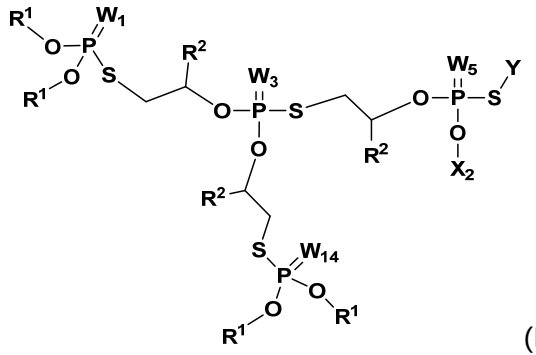
$X_2$ is selected from the group consisting of $R^8$,  , and  ; $R^8$ is alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl; and

Z is  ,

wherein when $X_2$ is $R^8$, $X_1$ is Z; and

wherein $W_1$, $W_3$, $W_5$, $W_7$, $W_9$, and $W_{11}$ are each independently O or S, and at least one of $W_1$, $W_3$, $W_5$, $W_7$, $W_9$, and $W_{11}$ is O.

7. The compound of claim 6, wherein the compound of formula (II) is a compound of formula (IIa):



(IIa)

or a tribologically acceptable salt thereof,

each $R^1$ is the same or different and is independently selected from alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl;

each $R^2$ is independently selected from alkyl, alkenyl, cycloalkyl and cycloalkylalkyl;

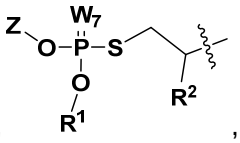
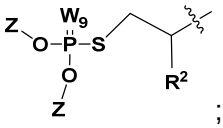
Y is selected from the group consisting of alkyl, alkoxyalkyl, benzyl, and $–R^4$-$R^5$-$R^6$;

$R^4$ is alkylene;

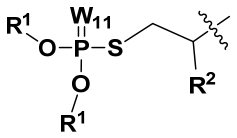
$R^5$ is selected from the group consisting of a bond, alkylene; -C(O)- and -C($R^7$)-;

$R^6$ is selected from the group consisting of alkyl, hydroxyalkyl, hydroxyalkyleneoxy, hydroxy and alkoxy;

$R^7$ is hydroxy;

$X_2$ is selected from the group consisting of $R^8$, , and ;

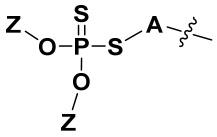
$R^8$ is alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl; and

Z is ;

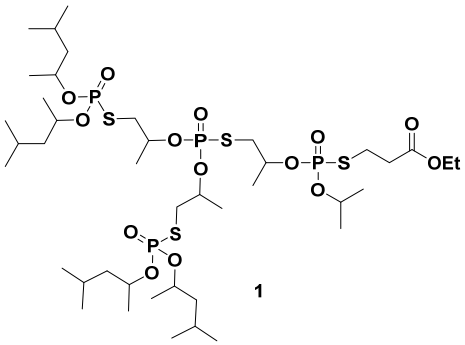
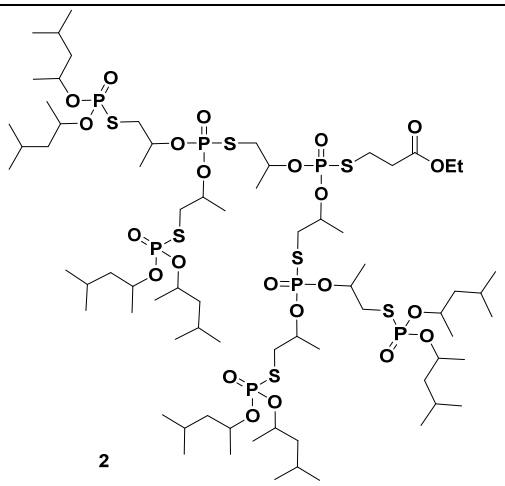
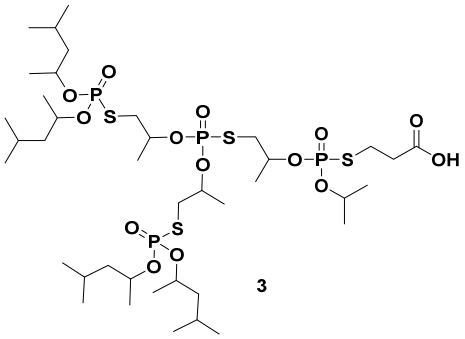
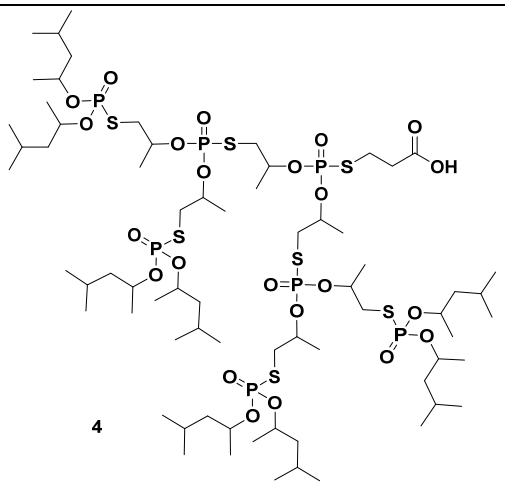
$W_1$, $W_3$, $W_5$, $W_7$, $W_9$, $W_{11}$ and $W_{14}$ are each independently O or S, and at least one of $W_1$, $W_3$, $W_5$, $W_7$, $W_9$, $W_{11}$ and $W_{14}$ is O.

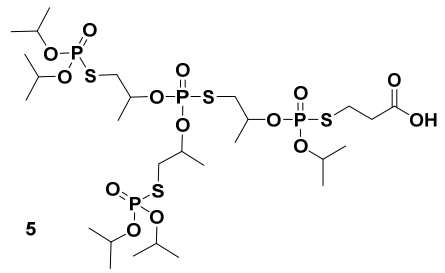
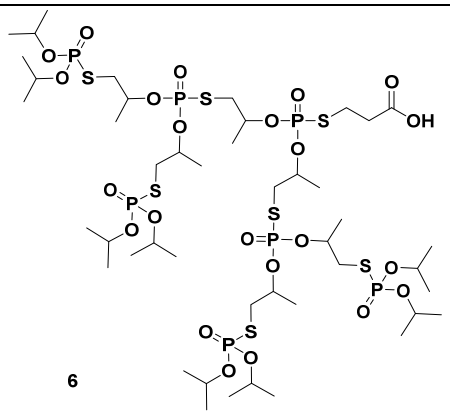
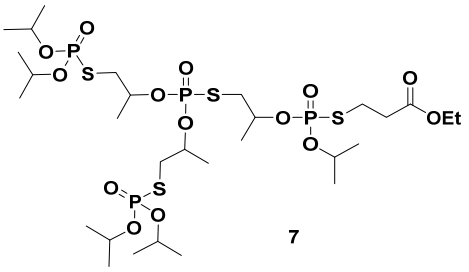
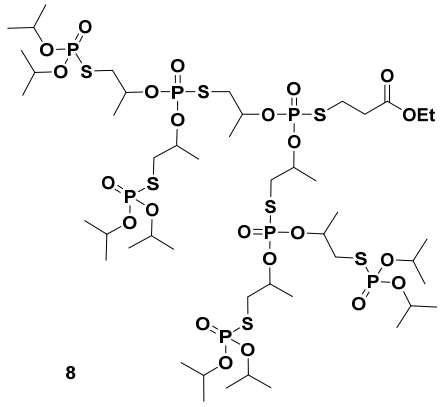
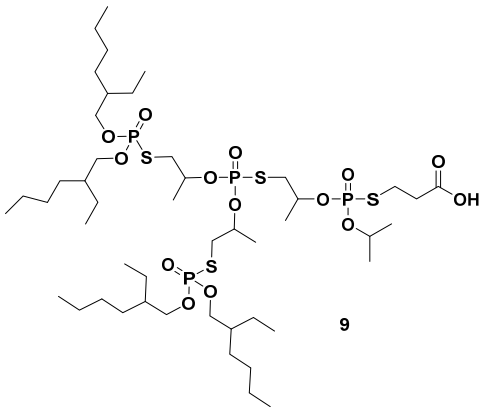
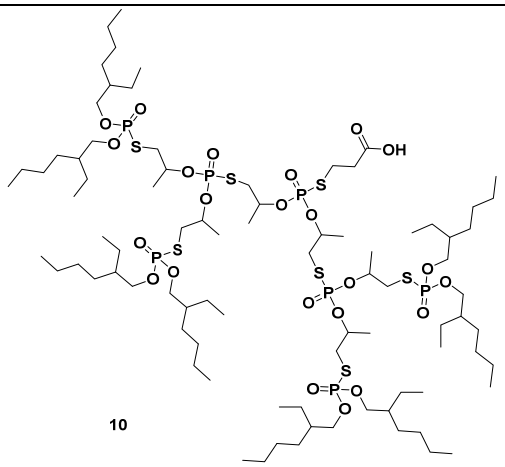
8. The compound of claim 6, wherein each $R^1$ is the same or different and is independently selected from $C_1$-$C_{30}$alkyl, $C_2$-$C_{30}$alkenyl, cycloalkyl, cycloalkylalkyl, aryl and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from $C_1$-$C_{10}$alkyl and $C_2$-$C_{10}$alkenyl.

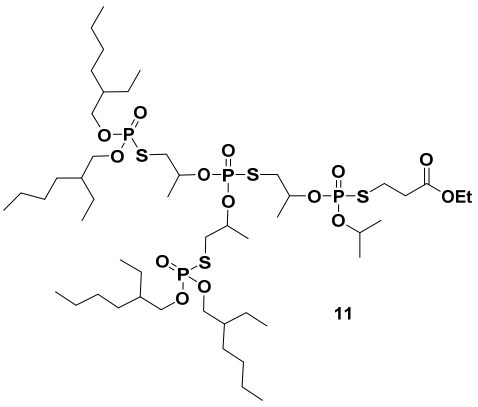
9. The compound of claim 6, wherein $R^2$ is $C_1$-$C_{10}$alkyl.

10. The compound of claim 6, wherein $X_2$ is  or $R^8$.

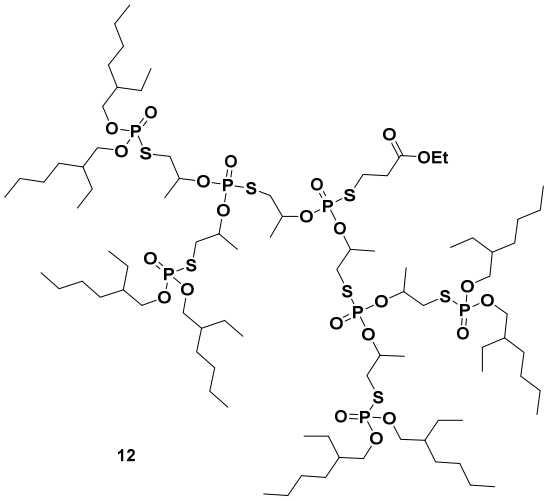
11. The compound of claim 1, selected from

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|  3 |  4 |

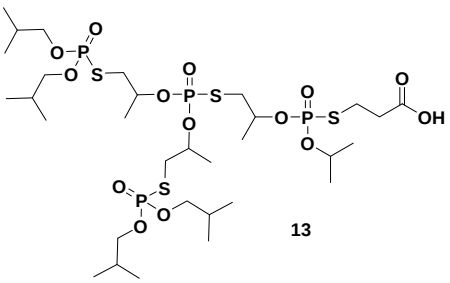
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|  9 |  10 |



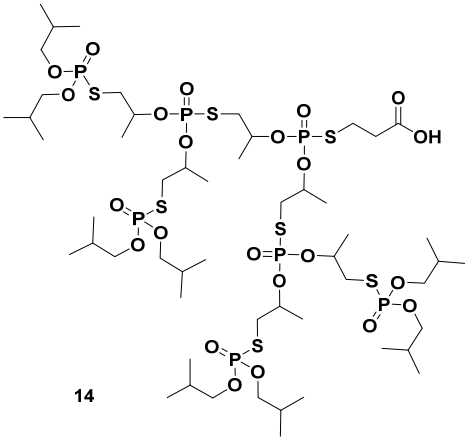
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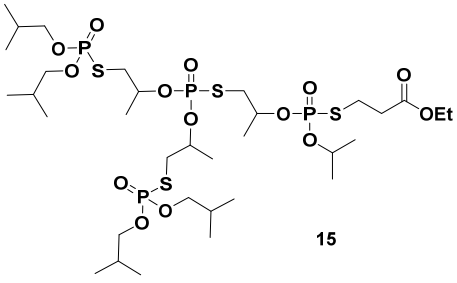
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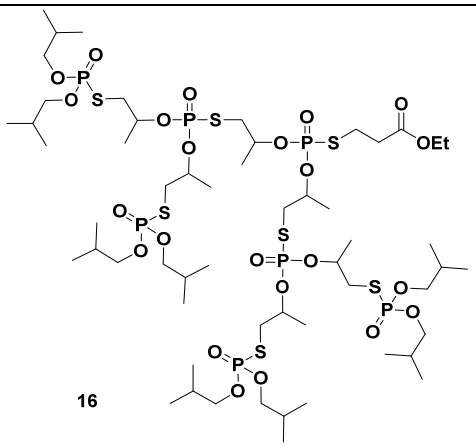
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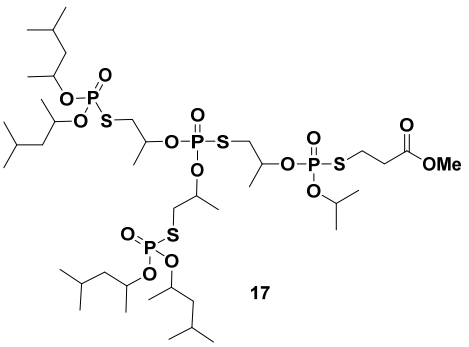
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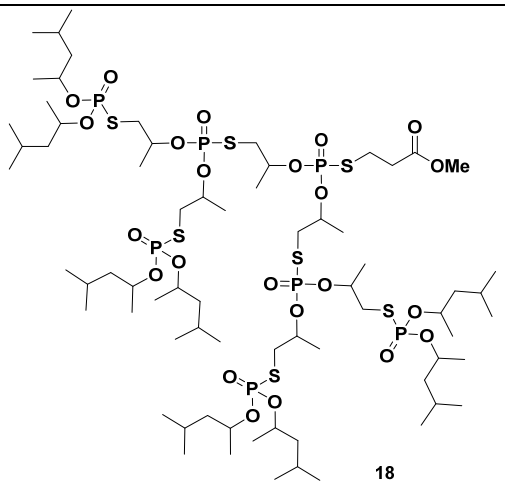
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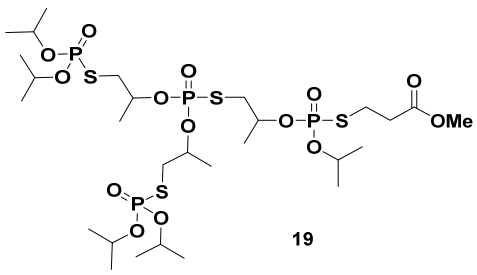
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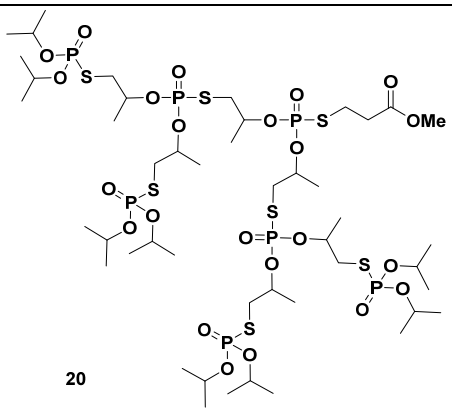
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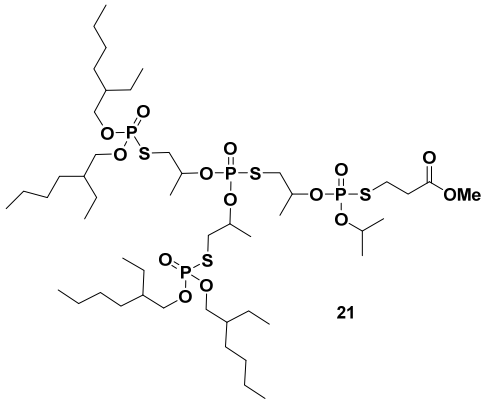
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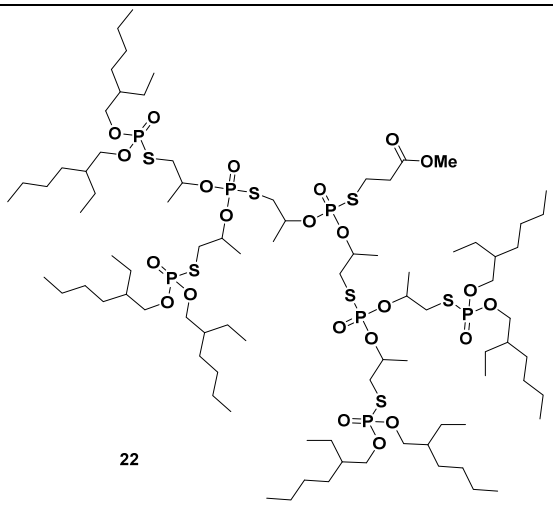
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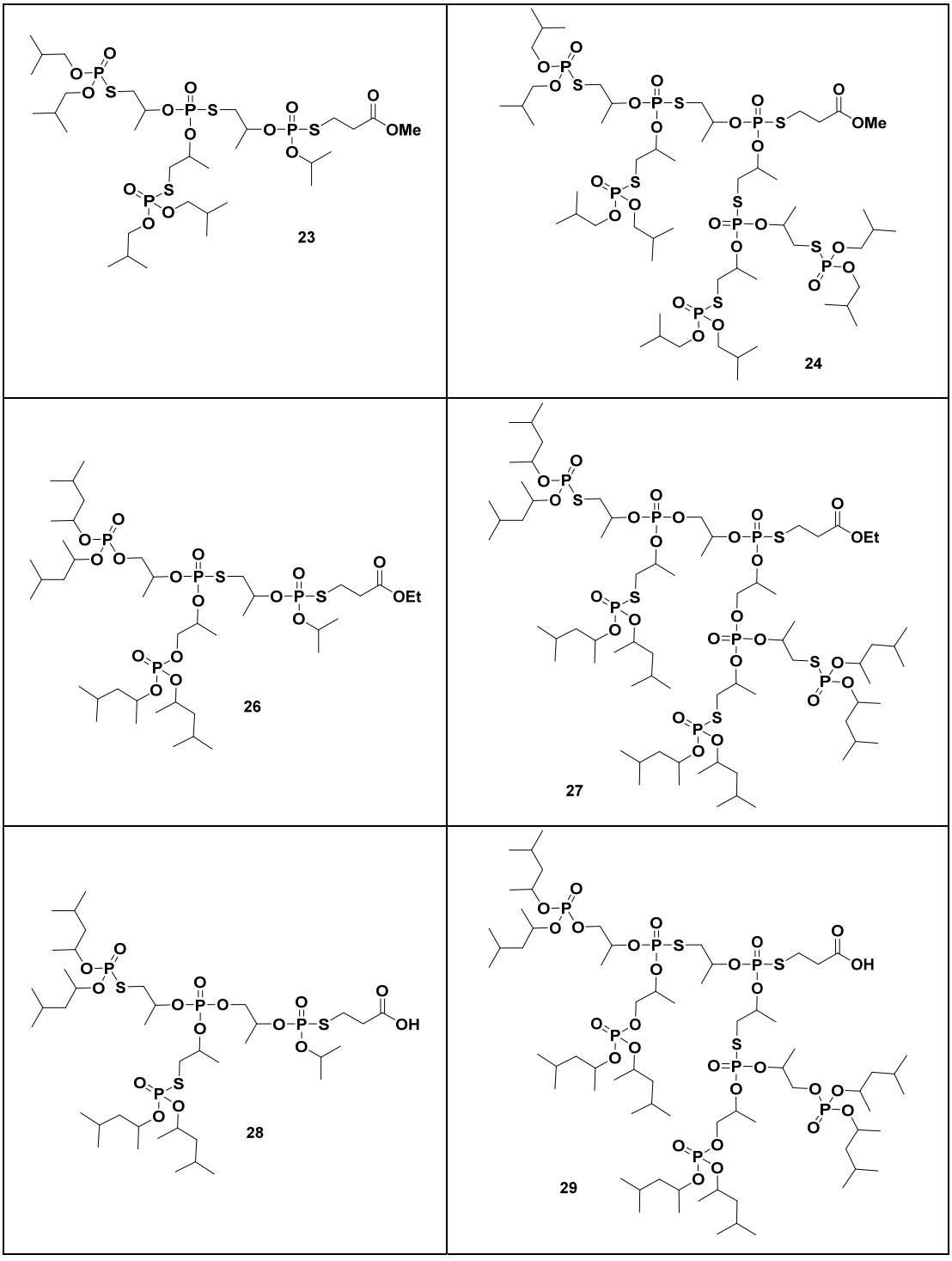
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12. A lubricant additive composition comprising a compound of claim 1.

13. A lubricant composition comprising:

a) a base oil; and

b) a compound of claim 1, and

wherein the base oil is a major amount of the composition.

14. A method of lubricating moving metal surfaces comprising lubricating the metal surfaces with a lubricant composition of claim 13.

15. A method of reducing wear between moving metal surfaces of a machine part comprising lubricating the machine part with a lubricant composition comprising:

a) a major amount of an oil of lubricating viscosity; and

b) an effective amount of a compound of claim 1.