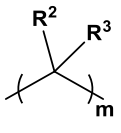
wherein A is:  ;

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 $–R^4\text{-}R^5\text{-}R^6$;

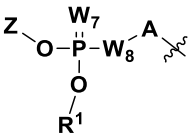
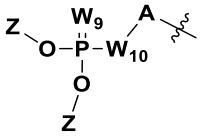
R^4 is alkylene;

R^5 is -C(O);

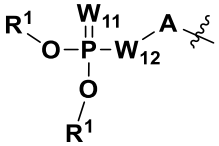
R^6 is hydroxy or alkoxy;

m is an integer from 2 to 8;

X_1 is R^8 or Z;

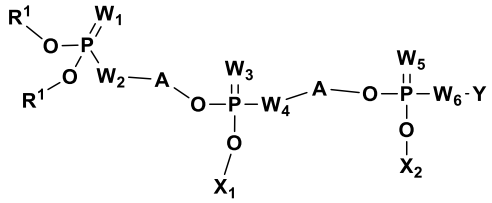
X_2 is selected from the group consisting of R^8,  , and  ;

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  ,

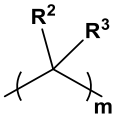
CLAIMS

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 $–R^4\text{-}R^5\text{-}R^6$;

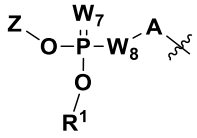
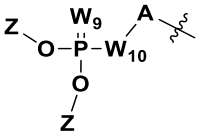
R^4 is alkylene;

R^5 is -C(O);

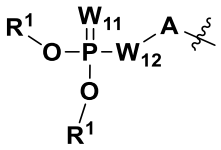
R^6 is hydroxy or alkoxy;

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  ;

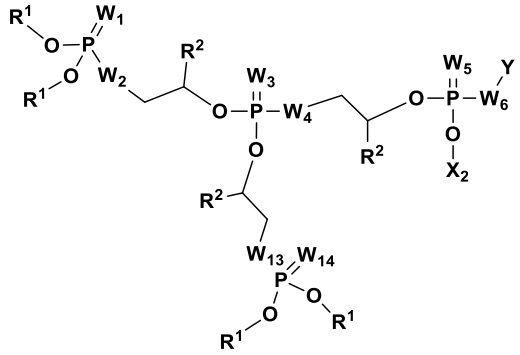
R^8 is alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl; and

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;

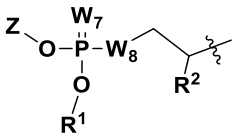
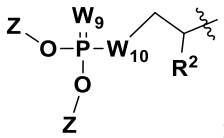
each R^2 is independently selected from alkyl, alkenyl, cycloalkyl and cycloalkylalkyl;

Y is $–R^4$-R^5-R^6;

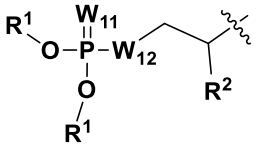
R^4 is alkylene;

R^5 is -C(O)-;

R^6 is hydroxy or alkoxy;

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

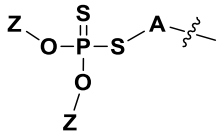
R^8 is alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl;

Z is  ; and

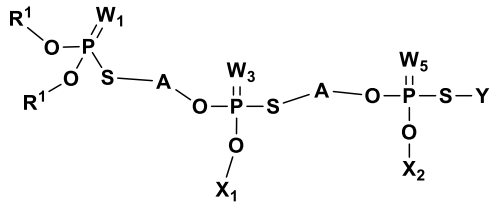
W_1-W_{14} are each independently O or S, and at least one of W_1-W_{14} is O.

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.

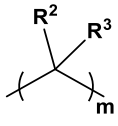
5. The compound of claim 1, wherein X_2 is  or R^8.

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 $–R^4\text{-}R^5\text{-}R^6$;

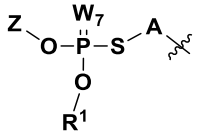
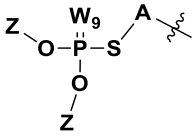
R^4 is alkylene;

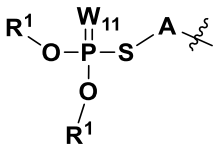
R^5 is -C(O)-;

R^6 is hydroxy or alkoxy;

m is an integer from 2 to 8;

X_1 is R^8 or Z;

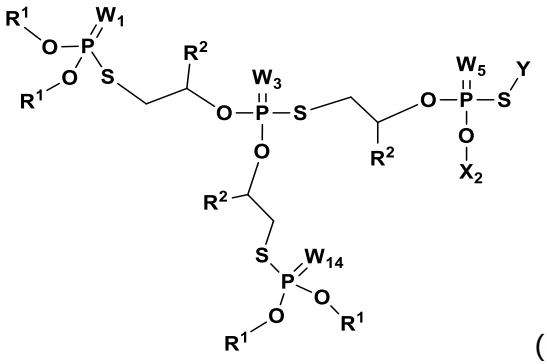
X_2 is selected from the group consisting of R^8,  , and  ; R^8 is alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl; and

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;

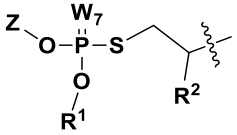
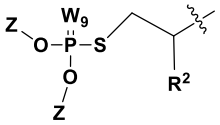
each R^2 is independently selected from alkyl, alkenyl, cycloalkyl and cycloalkylalkyl;

Y is R^4-R^5-R^6;

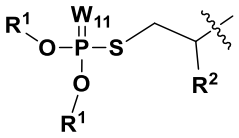
R^4 is alkylene;

R^5 is -C(O)-;

R^6 is hydroxy or alkoxy;

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

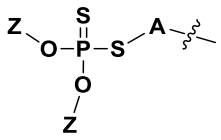
R^8 is alkyl, alkenyl, cycloalkyl, cycloalkylalkyl, aryl, and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected from alkyl and alkenyl; and

Z is ;

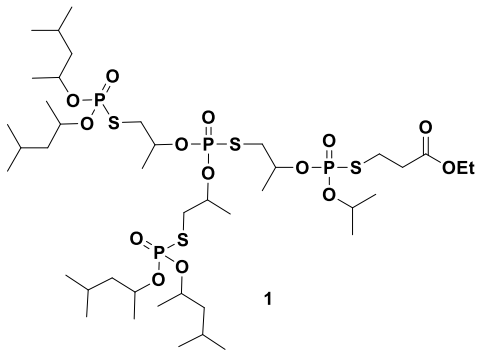
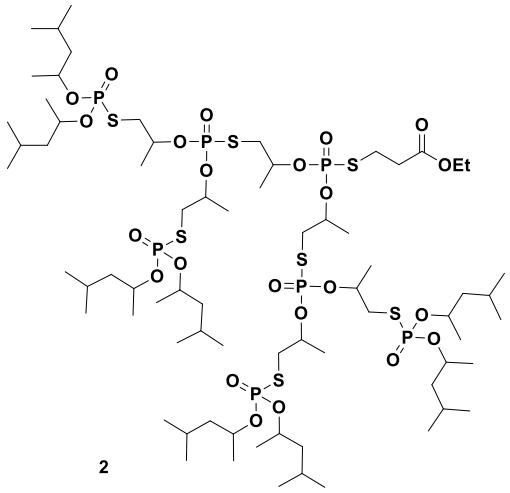
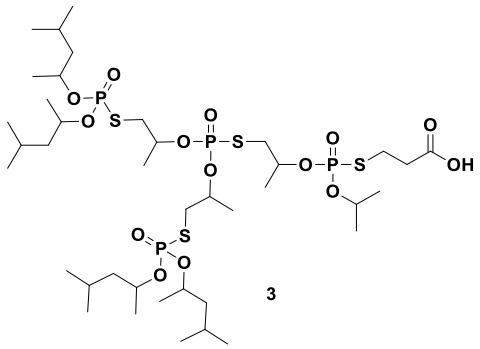
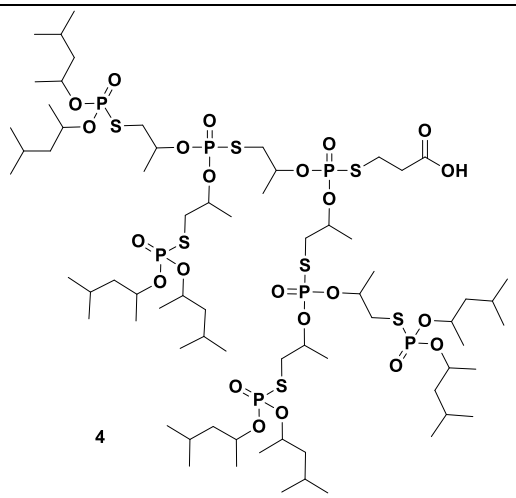
W_1, W_3, W_5, W_7, W_9, W_{11} and W_{14} are each independently O or S, and at least one of W_1, W_3, W_5, W_7, W_9, W_{11} and W_{14} is O.

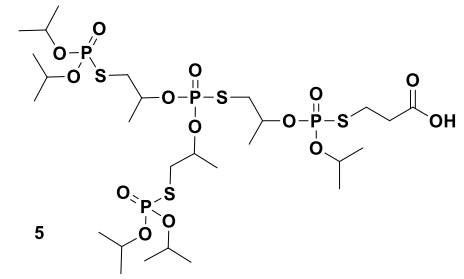
8. The compound of claim 6, wherein each R^1 is the same or different and is independently selected from C_1-C_{30}alkyl, C_2-C_{30}alkenyl, cycloalkyl, cycloalkylalkyl, aryl and aralkyl, wherein said aryl and aralkyl are optionally substituted with one to three substituents each independently selected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

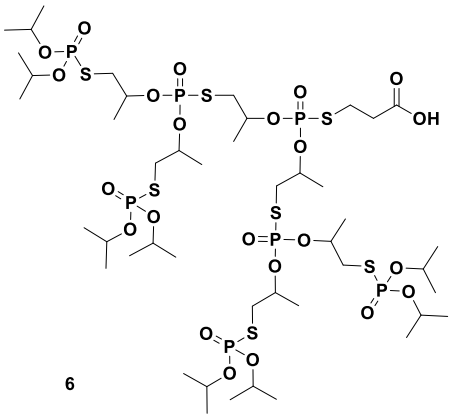
10. The compound of claim 6, wherein X_2 is  or R^8.

11. The compound of claim 1, selected from

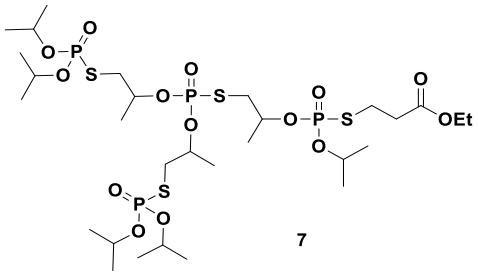
 1	 2
 3	 4



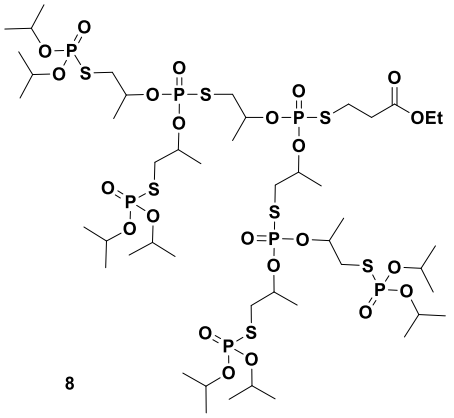
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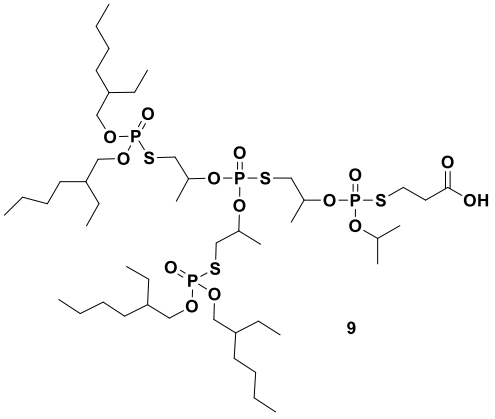
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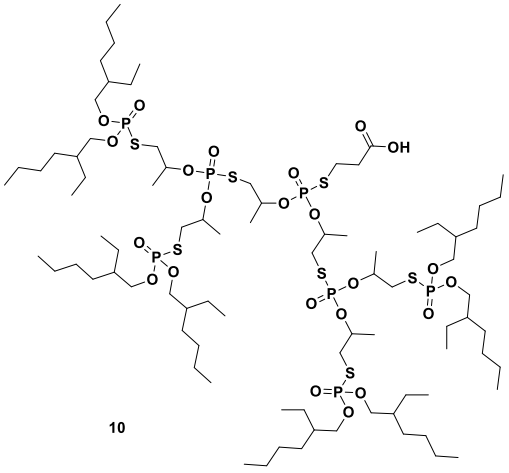
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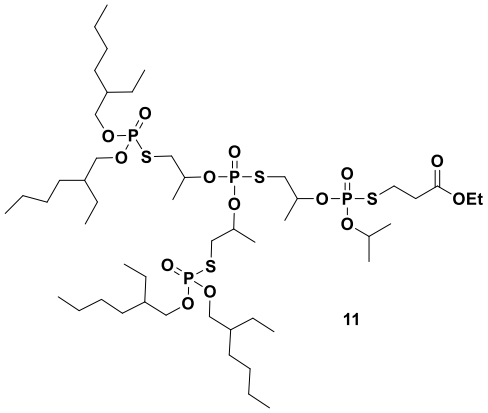
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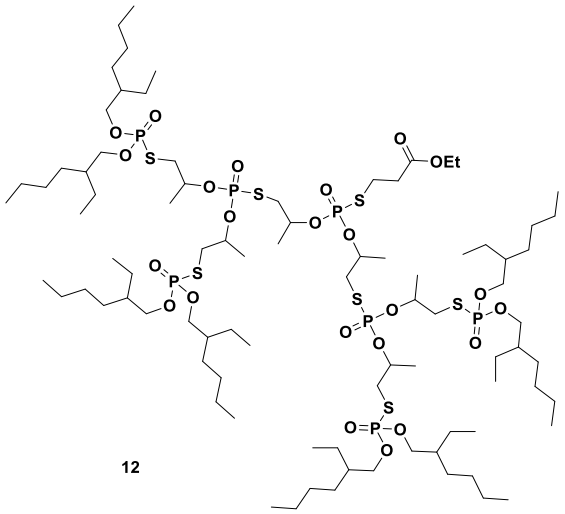
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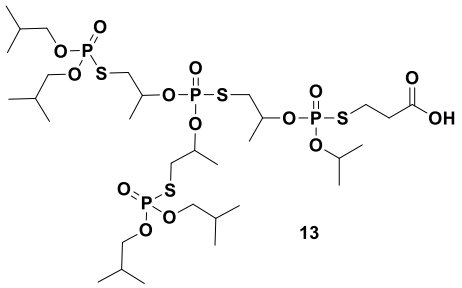
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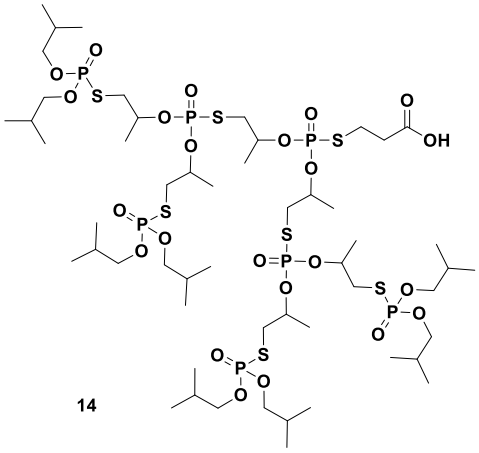
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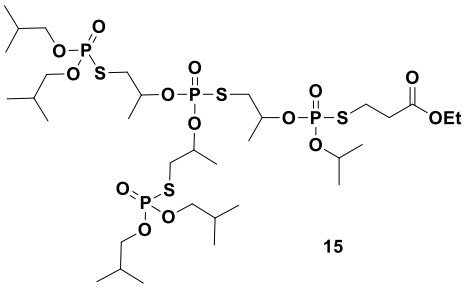
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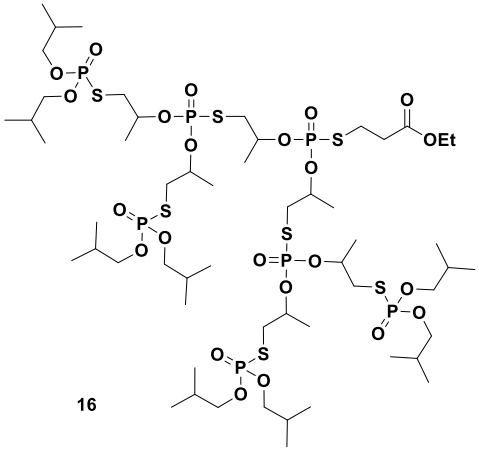
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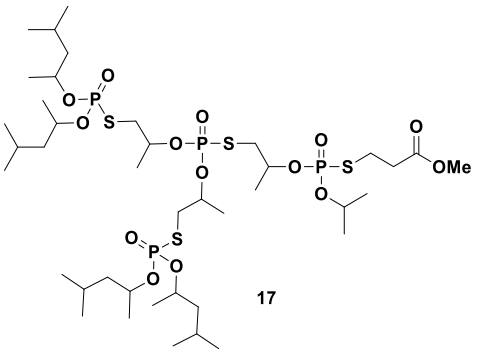
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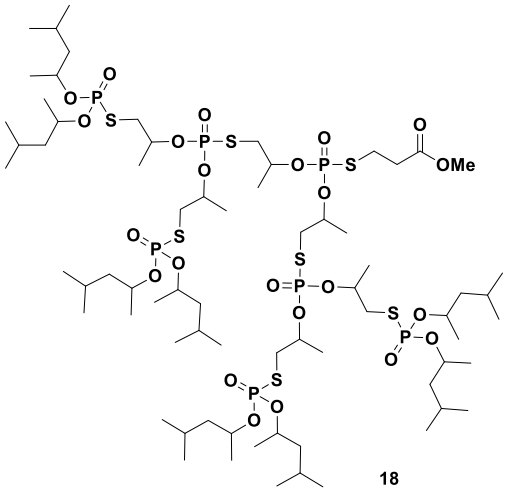
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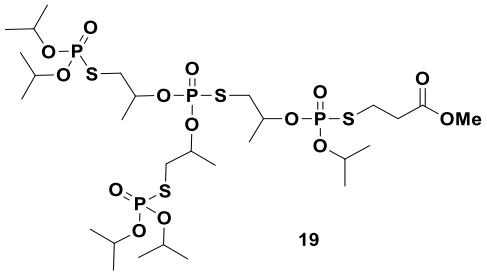
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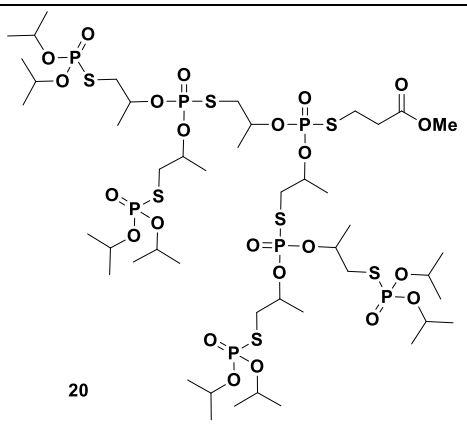
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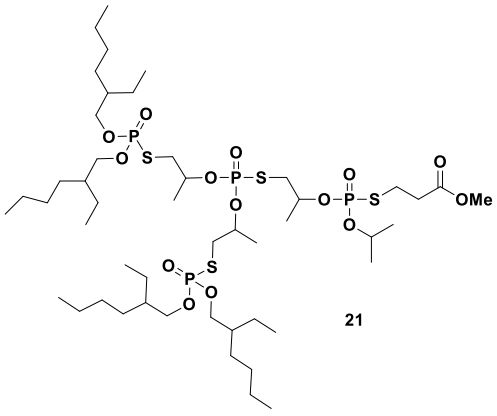
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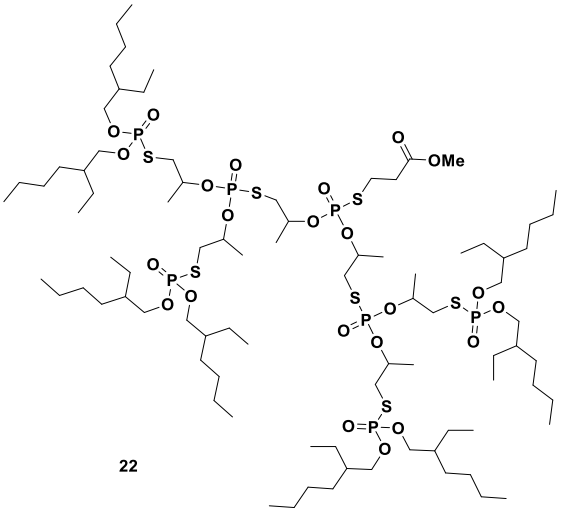
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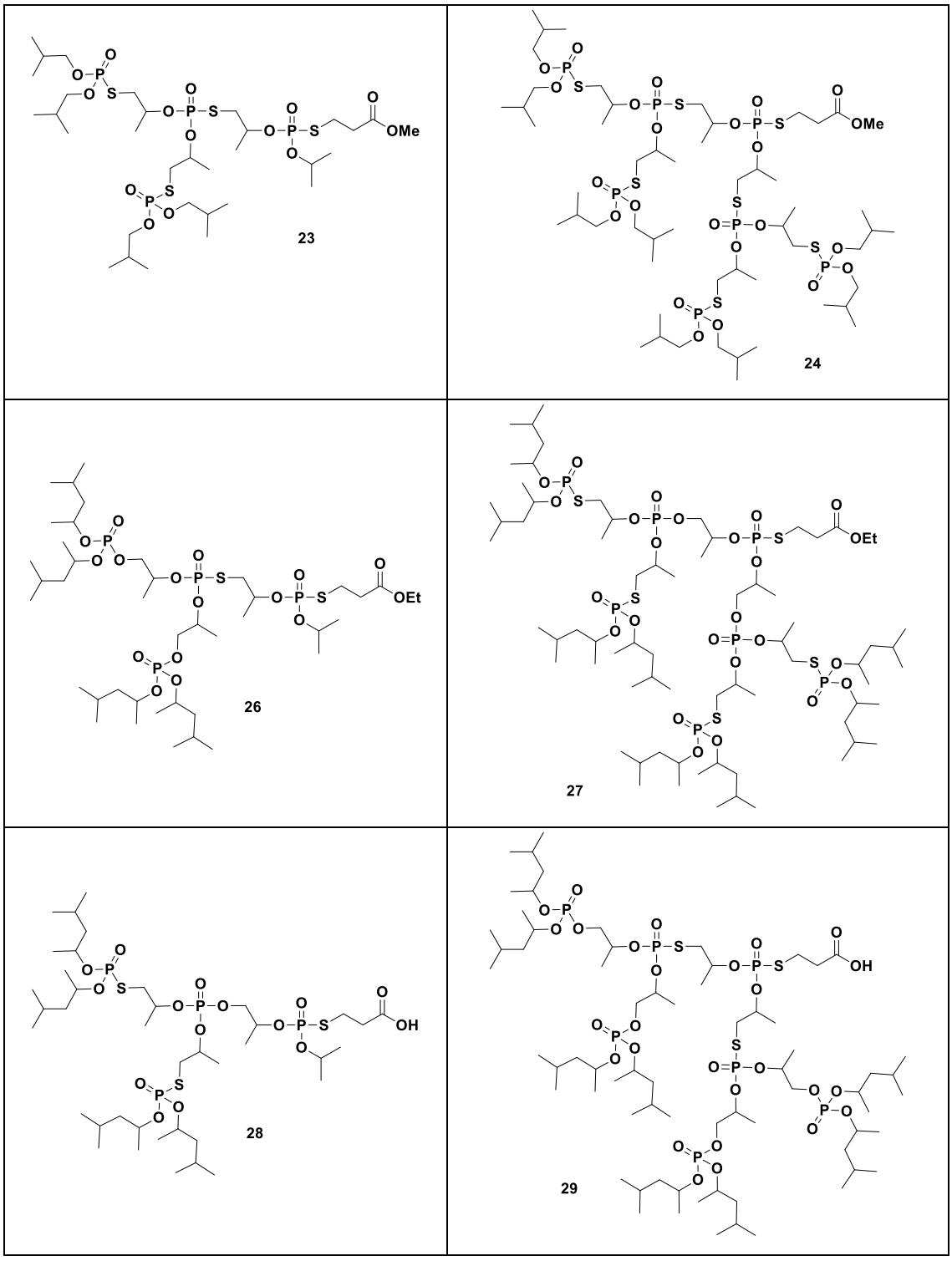
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21



22



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.