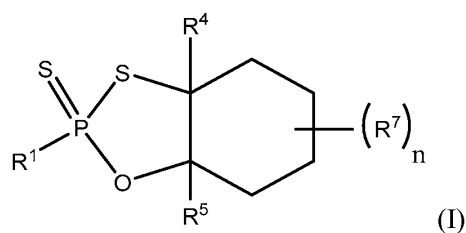


WHAT IS CLAIMED IS:

1. A compound of Formula (I):



or a salt thereof; wherein:

R^1 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-10} cycloalkyl, C_{6-10} aryl, or C-attached heteroaryl, wherein R^1 is optionally substituted with one or more, the same or different, R^a groups;

R^a is deuterium, CD_3 , C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halogen, CF_3 , C_{1-6} alkoxy, C_{3-10} cycloalkyl, C_{6-10} aryl or C-attached heteroaryl;

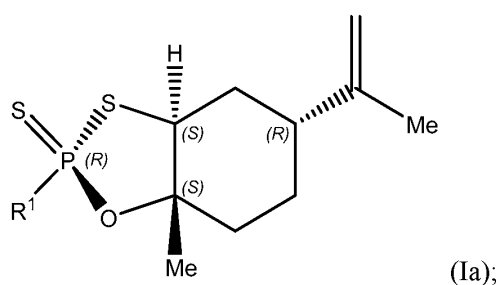
R^4 is hydrogen, C_{1-6} alkyl, C_{2-6} alkenyl, or C_{2-6} alkynyl;

R^5 is C_{1-6} alkyl, C_{2-6} alkenyl, or C_{2-6} alkynyl;

R^7 is a substituent that substitutes for a hydrogen and is one of C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-10} cycloalkyl, or C_{6-10} aryl; and

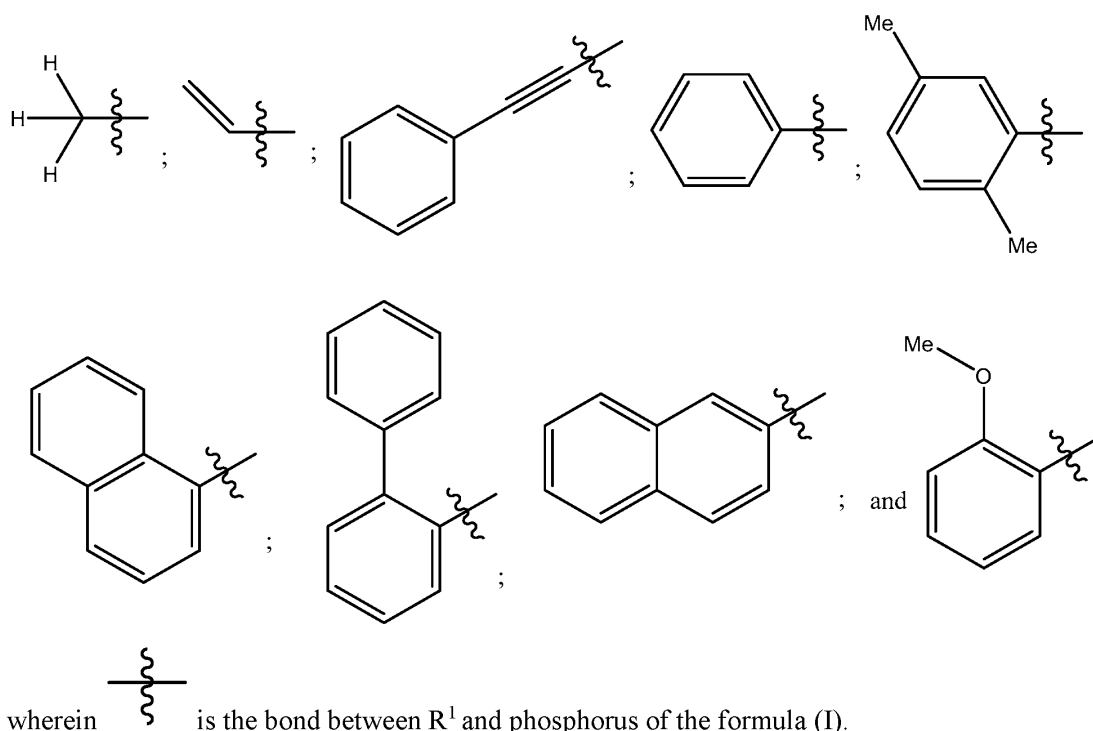
n is 0, 1, 2, 3, 4, 5, 6, 7, or 8.

2. The compound of claim 1, having Formula (Ia):

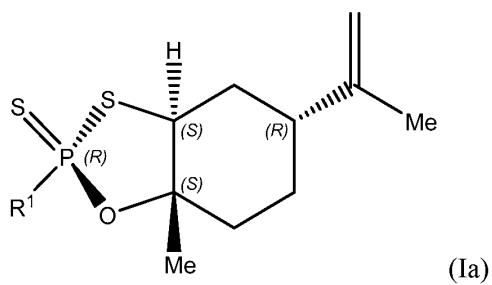


a salt thereof, an enantiomer thereof, or a combination thereof.

3. The compound of claim 1, wherein R^1 is selected from the group consisting of:



4. The compound according to claim 3, wherein R¹ is -CH₃.
5. The compound according to claim 3, wherein R¹ is phenyl.
6. A method of making a thiophosphinic acid, the method comprising:
reacting a carbanion reagent with a compound of Formula (Ia):



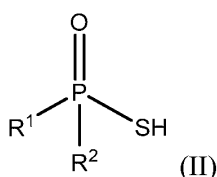
a salt thereof, an enantiomer thereof, or a combination thereof;
wherein

R^1 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-10} cycloalkyl, C_{6-10} aryl, or C-attached heteroaryl, wherein R^1 is optionally substituted with one or more, the same or different, R^a groups;

R^a is deuterium, CD_3 , C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halogen, CF_3 , C_{1-6} alkoxy, C_{3-10} cycloalkyl, C_{6-10} aryl or C-attached heteroaryl;

to form a thiophosphinic acid.

7. The method of claim 6, wherein the thiophosphinic acid has Formula (II):



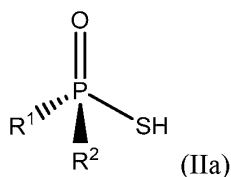
wherein each of R^1 and R^2 is independently

C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-10} cycloalkyl, C_{6-10} aryl, or C-attached heteroaryl, wherein each of R^1 and R^2 is optionally substituted with one or more, the same or different, R^a groups;

R^a is deuterium, CD_3 , C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halogen, CF_3 , C_{1-6} alkoxy, C_{3-10} cycloalkyl, C_{6-10} aryl or C-attached heteroaryl.

8. The method of claim 7, wherein the carbanion reagent is an organolithium reagent R^2Li , wherein R^2 is as defined in claim 7.

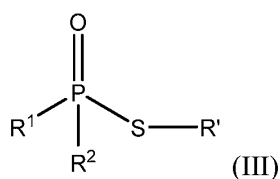
9. The method of claim 7, wherein the thiophosphinic acid is a compound having Formula (IIa)



or an enantiomer thereof, wherein R^1 and R^2 are as defined in claim 7.

10. The method of claim 6, further comprising reacting the thiophosphinic acid with an alkylating reagent to form a thiophosphinic acid ester.

11. The method of claim 10, wherein the thiophosphinic acid ester has Formula (III)



wherein

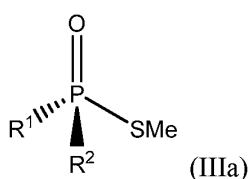
each of R¹ and R² is independently C₁₋₆ alkyl, C₂₋₆ alkenyl, C₂₋₆ alkynyl, C₃₋₁₀ cycloalkyl, C₆₋₁₀ aryl, or C-attached heteroaryl;

wherein each of R¹ and R² is optionally substituted with one or more, the same or different, R^a groups;

R^a is deuterium, CD₃, C₁₋₆ alkyl, C₂₋₆ alkenyl, C₂₋₆ alkynyl, halogen, CF₃, C₁₋₆ alkoxy, C₃₋₁₀ cycloalkyl, C₆₋₁₀ aryl or C-attached heteroaryl; and

R' is C₁₋₆ alkyl, C₂₋₆ alkenyl, or C₂₋₆ alkynyl.

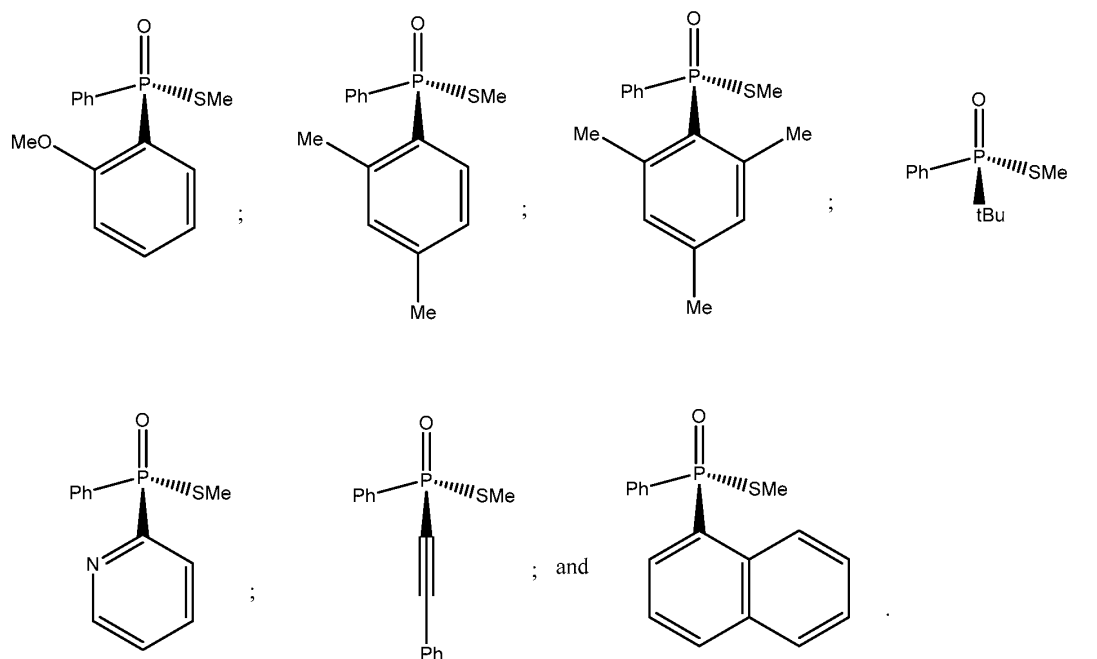
12. The method of claim 11, wherein the thiophosphinic acid ester is a compound having Formula (IIIa):



or an enantiomer thereof.

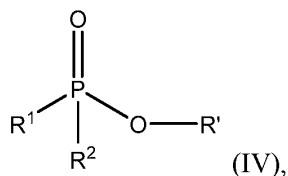
13. The method of claim 12, wherein the thiophosphinic acid ester is selected from the group consisting of

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14. The method of claim 10, further comprising reacting the thiophosphinic acid ester with an alkoxide agent to form an organophosphinate.

15. The method of claim 14, wherein the organophosphinate has Formula (IV):



wherein

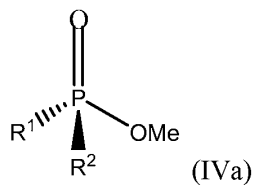
each of R^1 and R^2 is independently C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-10} cycloalkyl, C_{6-10} aryl, or C-attached heteroaryl;

wherein each of R^1 and R^2 is optionally substituted with one or more, the same or different, R^a groups;

R^a is deuterium, CD_3 , C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halogen, CF_3 , C_{1-6} alkoxy, C_{3-10} cycloalkyl, C_{6-10} aryl or C-attached heteroaryl; and

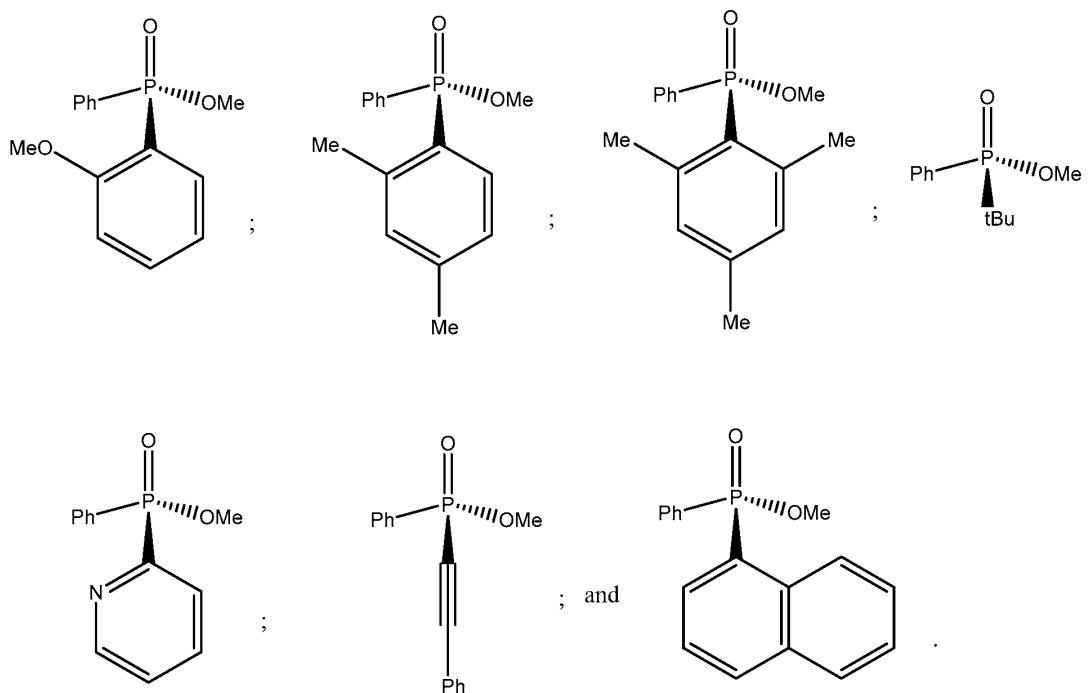
R' is C_{1-6} alkyl, C_{2-6} alkenyl, or C_{2-6} alkynyl.

16. The method of claim 15, wherein the organophosphinate is the compound having Formula (IVa):



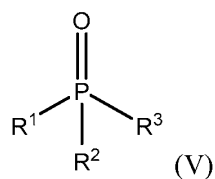
or an enantiomer thereof.

17. The method of claim 16, wherein the organophosphinate is selected from the group consisting of



18. The method of claim 14, further comprising reacting the organophosphinate with a carbanion reagent to form a phosphine oxide.
19. The method of claim 18, the phosphine oxide is a compound having Formula (V)

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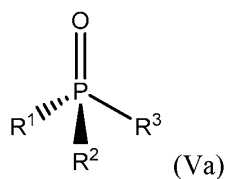


wherein each of R^1 , R^2 , and R^3 is independently C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-10} cycloalkyl, C_{6-10} aryl, or C-attached heteroaryl;

wherein each of R^1 , R^2 , and R^3 is optionally substituted with one or more, the same or different, R^a groups;

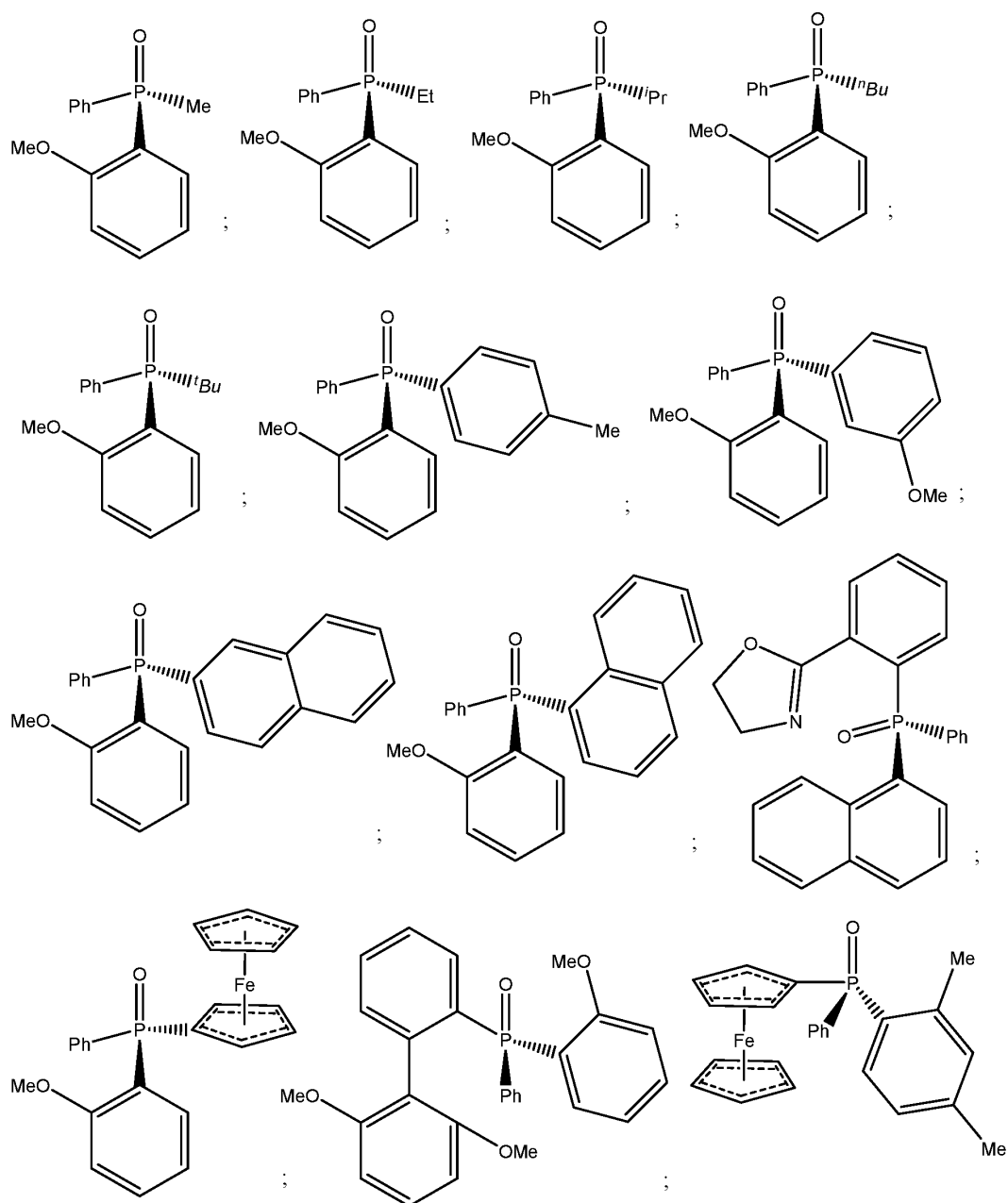
R^a is deuterium, CD_3 , C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halogen, CF_3 , C_{1-6} alkoxy, C_{3-10} cycloalkyl, C_{6-10} aryl or C-attached heteroaryl.

20. The method of claim 19, wherein the phosphine oxide is a compound having Formula (Va)



or an enantiomer thereof.

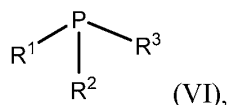
21. The method of claim 18, wherein the carbanion reagent is a Grignard reagent.
22. The method of claim 20, wherein the phosphine oxide is selected from the group consisting of



23. The method of claim 18, further comprising reacting the phosphine oxide with a reducing agent to form a phosphine.

24. The method of claim 23, wherein the phosphine is a compound having Formula (VI):

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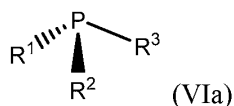


wherein R^1 , R^2 , and R^3 are independently C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-10} cycloalkyl, C_{6-10} aryl, or C-attached heteroaryl;

wherein each of R^1 , R^2 , and R^3 is optionally substituted with one or more, the same or different, R^a groups; and

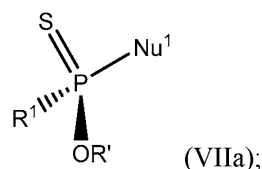
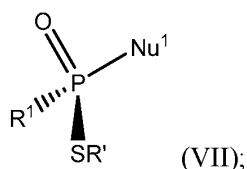
R^a is deuterium, CD_3 , C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halogen, CF_3 , C_{1-6} alkoxy, C_{3-10} cycloalkyl, C_{6-10} aryl or C-attached heteroaryl.

25. The method of claim 23, wherein the phosphine is a compound having Formula (VIa):



or an enantiomer thereof.

26. A method for making a nucleoside-loaded organophosphorus compound, comprising reacting a compound of Formula (Ia) or an enantiomer thereof with a nucleoside.
27. The method of claim 26, wherein the nucleoside-loaded organophosphorus compound is a compound having Formula (VII) or (VIIa)



or a diastereomer thereof,

wherein R^1 is C_{1-6} alkyl, C_{2-6} alkenyl, or C_{2-6} alkynyl;

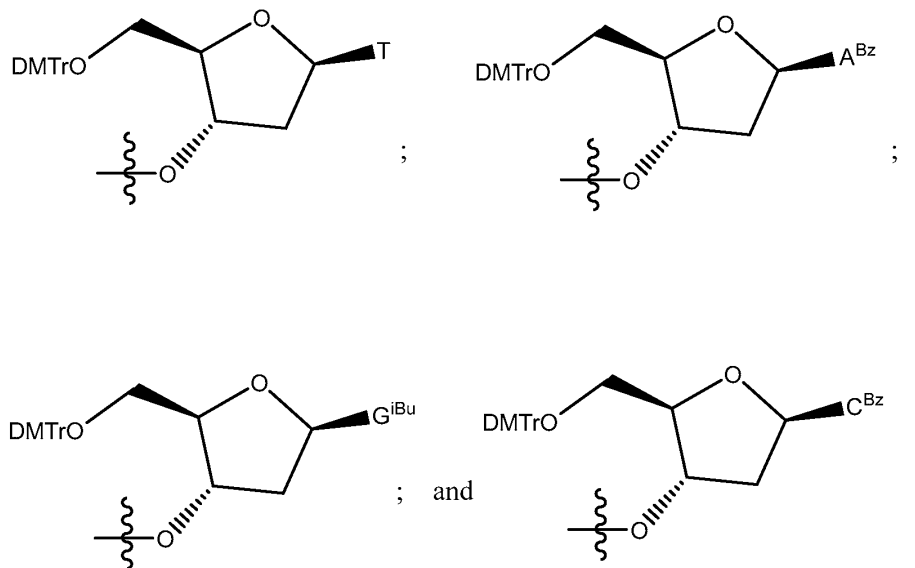
R' is C_{1-6} alkyl, C_{2-6} alkenyl, or C_{2-6} alkynyl;

Nu^1 is a nucleoside, and

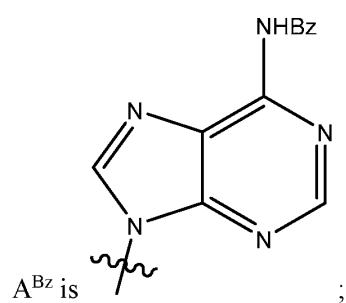
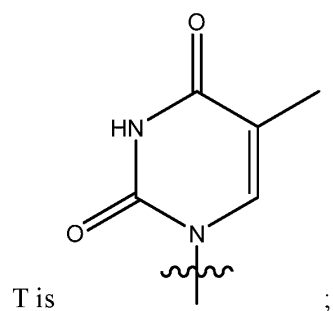
wherein Nu^1 optionally comprises, independently of each other, one or more, the same or different, modification or one or more, the same or different, protecting group.

28. The method of claim 27, wherein each of R^1 and R' is $-\text{CH}_3$.

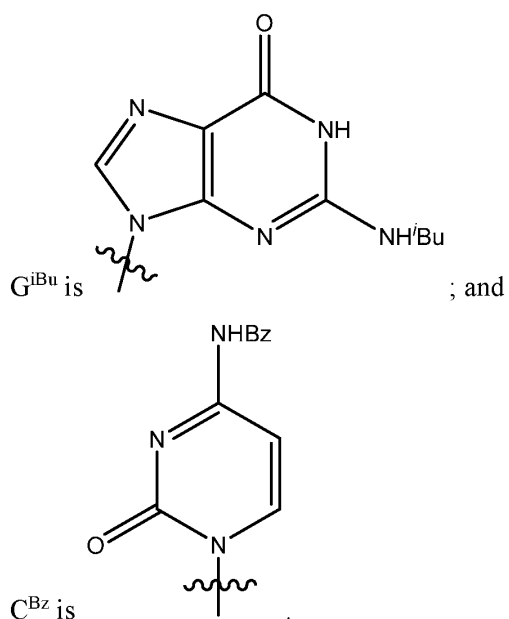
29. The method of claim 26, wherein Nu¹ is a nucleoside selected from the group consisting of



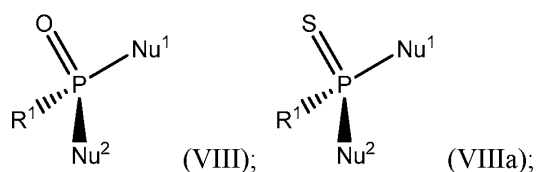
wherein



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30. The method of claim 26, further comprising reacting the nucleoside-loaded organophosphorus compound with a second nucleoside to form a dinucleotide.
31. The method of claim 30, wherein the dinucleotide is a compound having Formula (VIII) or (VIIIa)



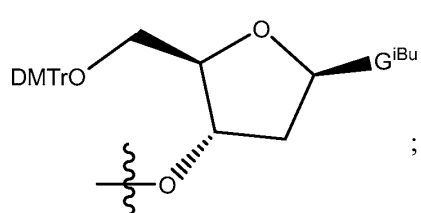
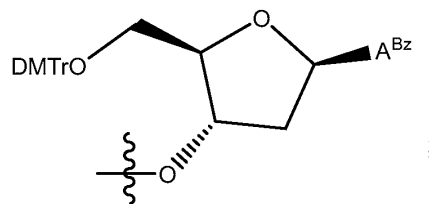
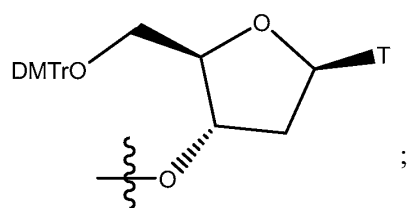
wherein R^1 is C_{1-6} alkyl, C_{2-6} alkenyl, or C_{2-6} alkynyl;

each of Nu^1 and Nu^2 is a nucleoside; and

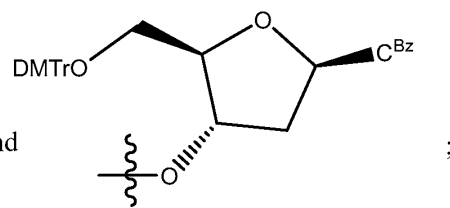
wherein either one or both Nu^1 and Nu^2 optionally comprise, independently of each other, one or more, the same or different, modification or one or more, the same or different, protecting group.

32. The method of claim 31, wherein R^1 is $-CH_3$; and
each of Nu^1 and Nu^2 is independently a nucleoside selected from the group consisting of

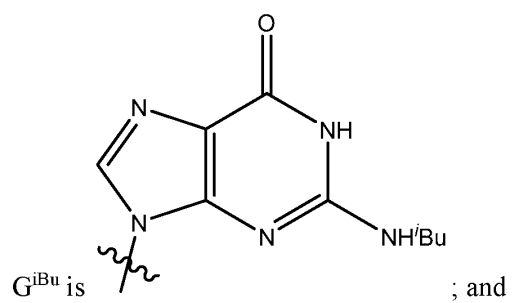
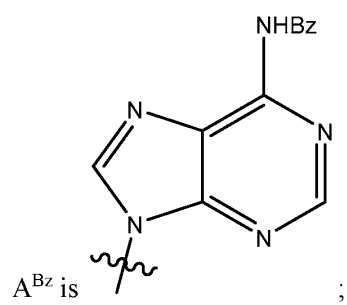
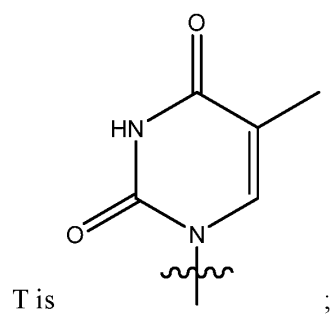
- 150 -

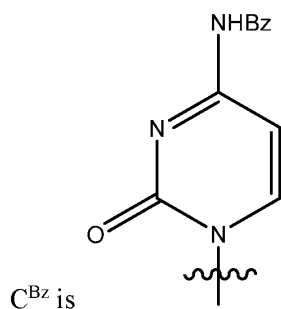


; and

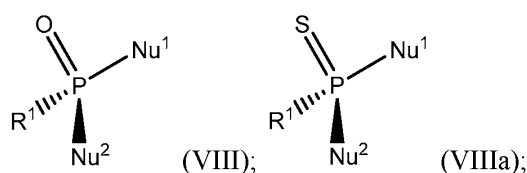


wherein





33. The method of claim 30, further comprising
- reacting the dinucleotide with a compound of Formula (Ia) to form a loaded dinucleotide;
 - reacting the loaded dinucleotide formed in step (a) with a third nucleoside, to form a trinucleotide;
 - repeating steps (a) and (b) one or more times to form a oligonucleotide having a desired number of nucleotides.
34. The method of claim 33, wherein the dinucleotide is a compound having Formulae (VIII) or (VIIIa):



or an enantiomer thereof;

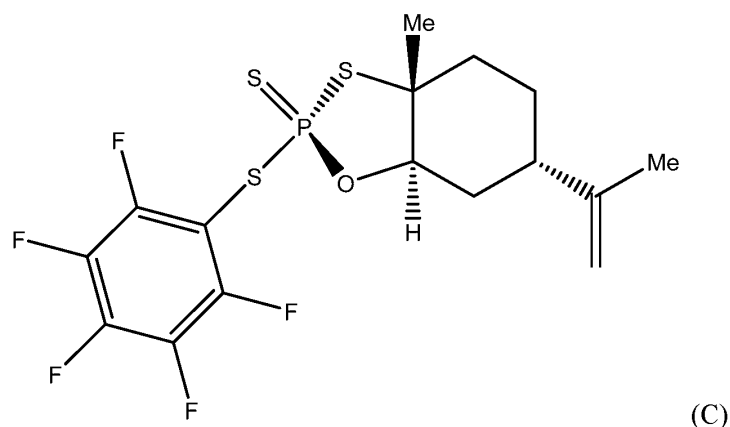
wherein R¹ is C₁₋₆ alkyl, C₂₋₆ alkenyl, or C₂₋₆ alkynyl;

each of Nu¹ and Nu² is a nucleoside;

wherein either one or both Nu¹ and Nu² optionally comprise, independently of each other, one or more, the same or different, modification or one or more, the same or different, protecting group.

35. The method of claim 30, further comprising
- reacting the dinucleotide with a compound of Formula C:

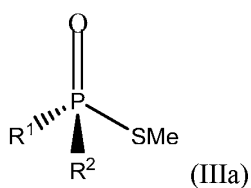
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or an enantiomer thereof to form a loaded chimeric dinucleotide; and

b) reacting the loaded chimeric dinucleoside formed in step (a) with a third nucleoside, to form a chimeric trinucleotide bearing a phosphonate linkage and a phosphorothioate linkage.

36. A compound of Formula (IIIa):



or an enantiomer thereof;

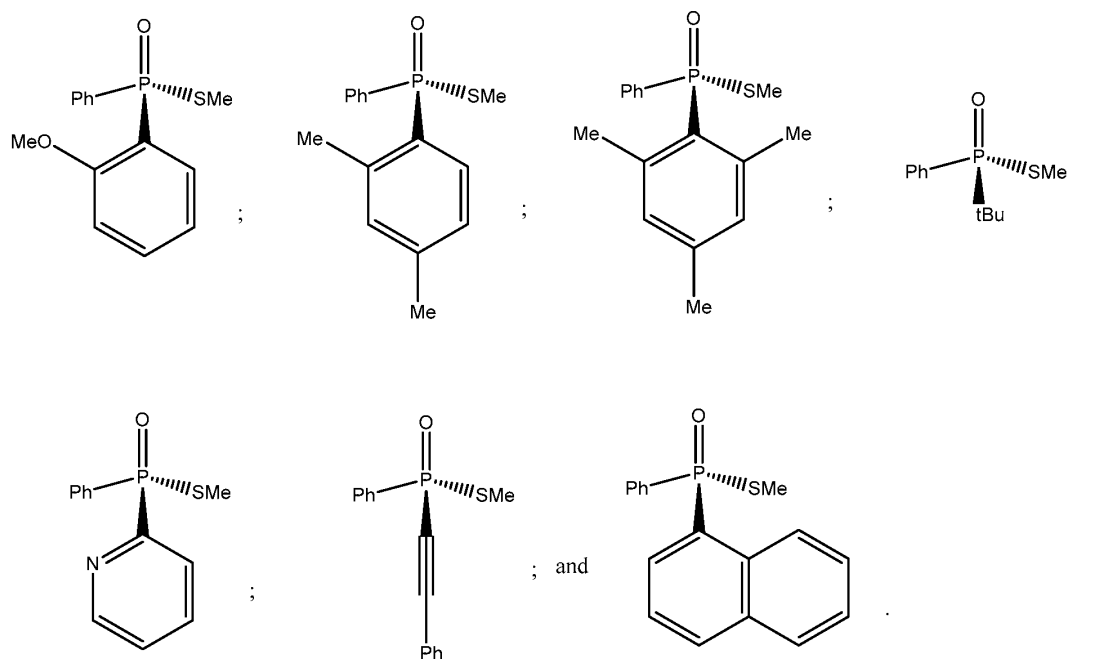
wherein

each of R^1 and R^2 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-10} cycloalkyl, C_{6-10} aryl, or C-attached heteroaryl;

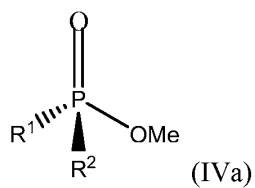
wherein each of R^1 and R^2 is optionally substituted with one or more, the same or different, R^a groups;

R^a deuterium, CD_3 , C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halogen, CF_3 , C_{1-6} alkoxy, C_{3-10} cycloalkyl, C_{6-10} aryl or C-attached heteroaryl.

37. The compound according to claim 36, selected from the group consisting of



38. A compound of Formula (IVa)



wherein

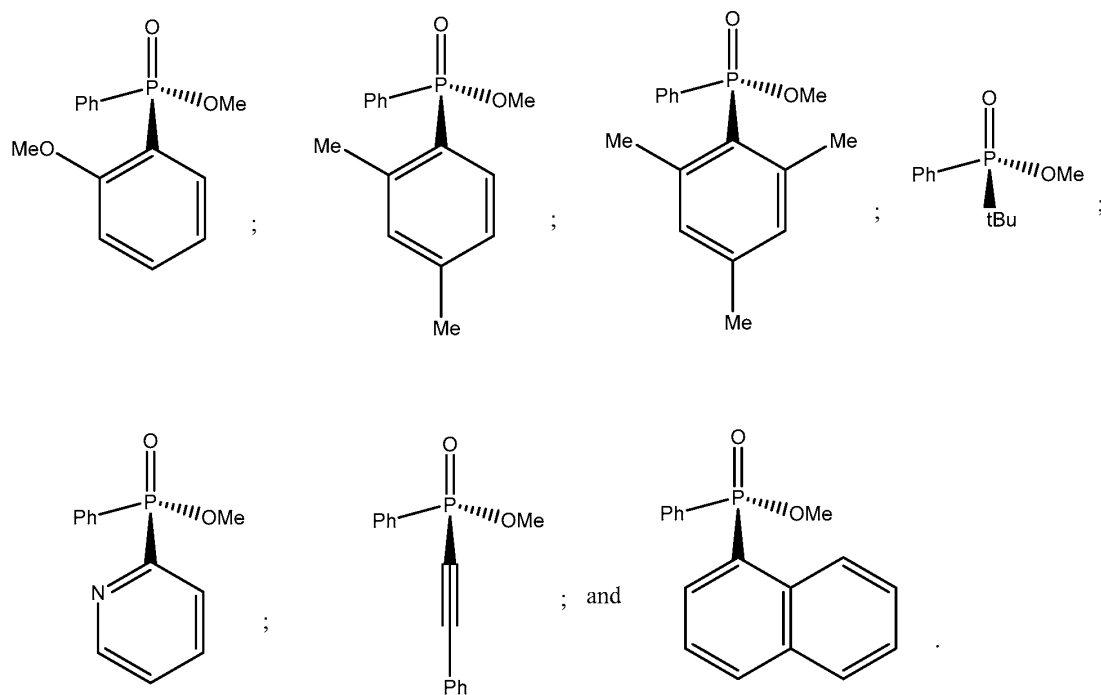
each of R^1 and R^2 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-10} cycloalkyl, C_{6-10} aryl, or C-attached heteroaryl;

wherein each of R^1 and R^2 is optionally substituted with one or more, the same or different, R^a groups;

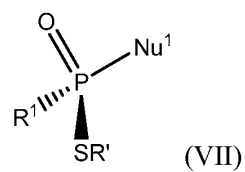
R^a is deuterium, CD_3 , C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halogen, CF_3 , C_{1-6} alkoxy, C_{3-10} cycloalkyl, C_{6-10} aryl or C-attached heteroaryl; or an enantiomer thereof.

39. The compound according to claim 38, selected from the group consisting of

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40. A compound of Formula (VII):



or an enantiomer thereof;

wherein

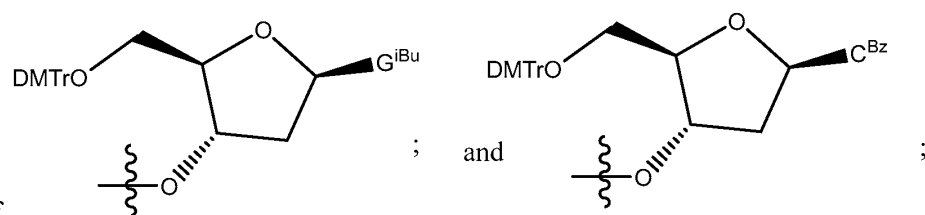
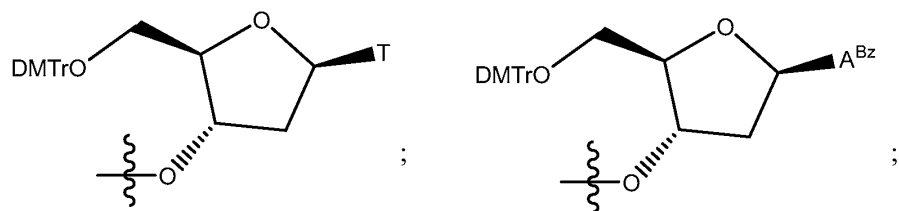
R^1 is C_{1-6} alkyl, C_{2-6} alkenyl, or C_{2-6} alkynyl;

R' is C_{1-6} alkyl, C_{2-6} alkenyl, or C_{2-6} alkynyl; and

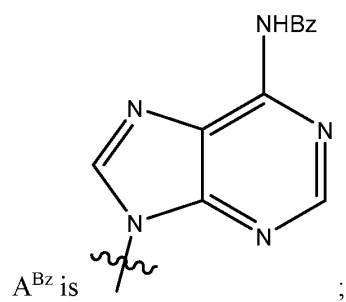
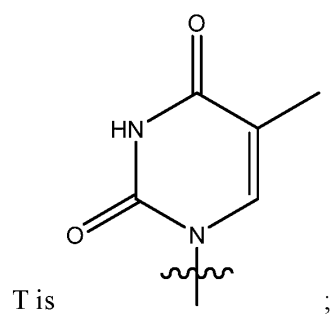
Nu^1 is a nucleoside.

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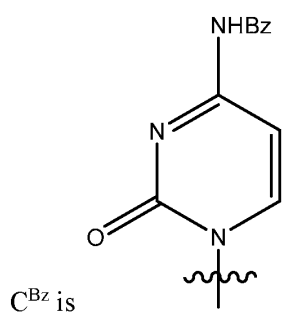
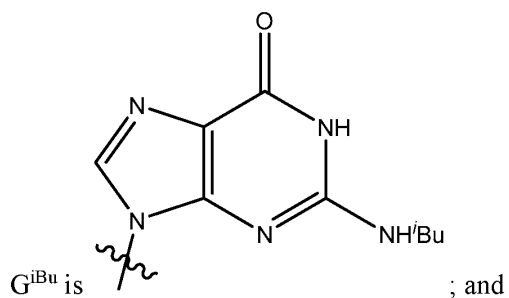
41. The compound according to claim 40, wherein Nu¹ is selected from the group consisting



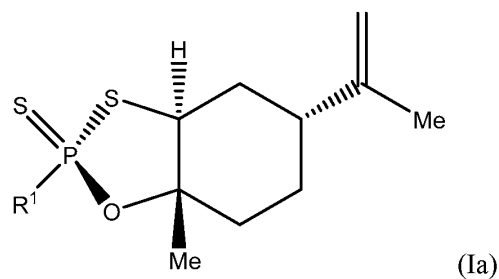
of
wherein



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42. A method of making a compound of Formula (Ia):



or an enantiomer thereof;

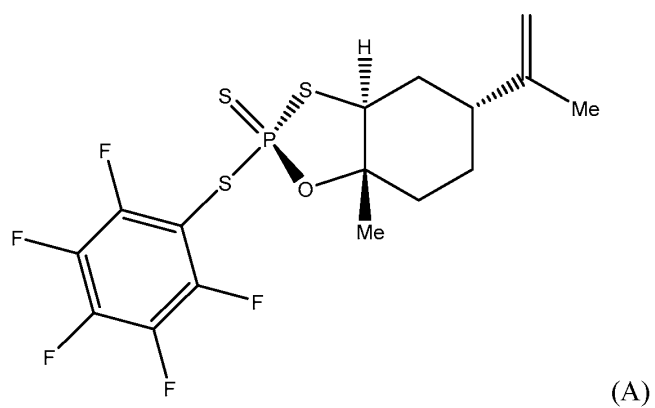
wherein R^1 is C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-10} cycloalkyl, C_{6-10} aryl, or C-attached heteroaryl;

wherein R^1 is optionally substituted with one or more, the same or different, R^a groups;

R^a is deuterium, CD_3 , C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, halogen, CF_3 , C_{1-6} alkoxy, C_{3-10} cycloalkyl, C_{6-10} aryl or C-attached heteroaryl;

comprising reacting a carbanion reagent with a compound of Formula A:

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or an enantiomer thereof,
to form a compound of Formula (Ia).

43. The method of claim 42, wherein the carbanion reagent is a Grignard reagent.