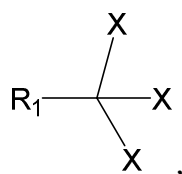


WHAT IS CLAIMED IS: CLAIMS

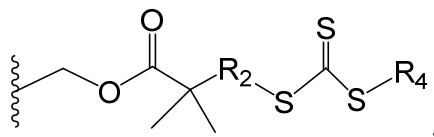
1. A nanoparticle, comprising

a scaffold, a single template site for bonding a template polynucleotide to the scaffold selected from a covalent template bonding site and a noncovalent template bonding site, and a plurality of accessory sites for bonding accessory oligonucleotides to the scaffold selected from covalent accessory oligonucleotide bonding sites and noncovalent accessory oligonucleotide bonding sites, wherein

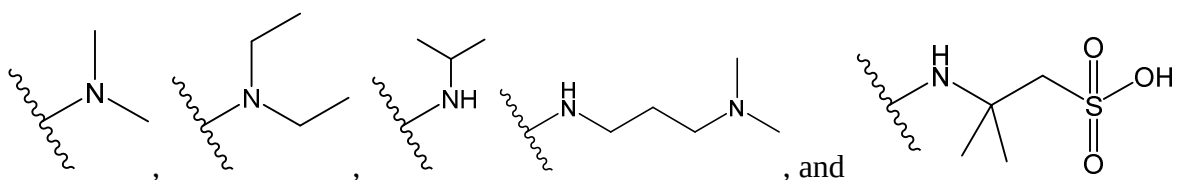
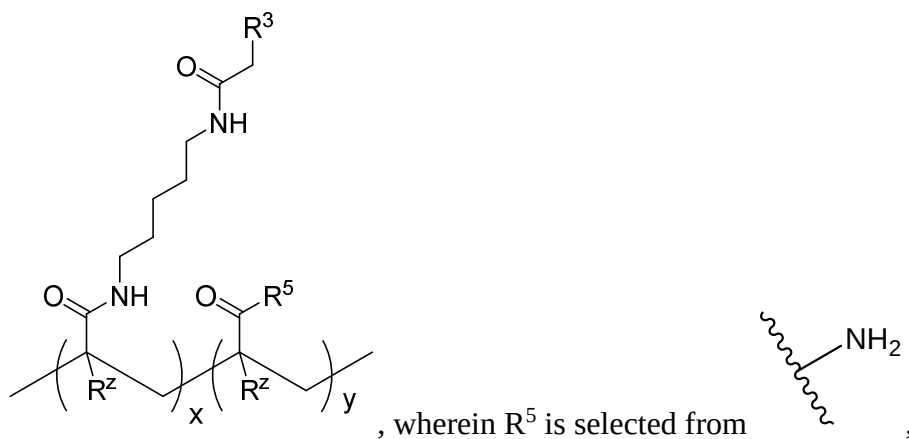
the scaffold is a compound of Formula I:



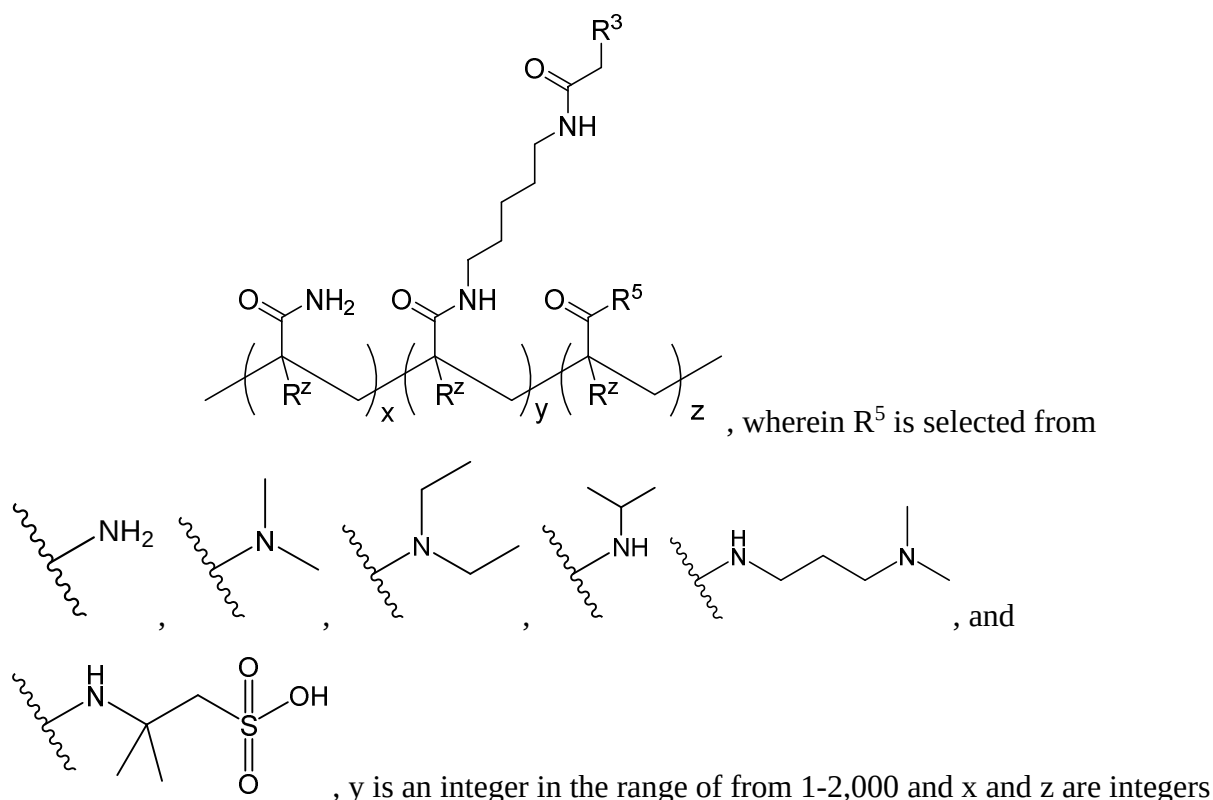
each X is a compound of formula II:



wherein R₂ is selected from Formula IIIa:



x is an integer in the range of from 1-20,000 and y is an integer in the range of from 1-100,000 and a ratio of x:y may be from approximately 10:90 to approximately 1:99, and wherein each R^z is independently H or C₁₋₄ alkyl, and Formula IIIb:



whose sum is in a range of from 1-10,000 and a ratio of $(x:y):z$ may be from approximately (85):15 to approximately (95):5, and wherein each R^Z is independently H or C_{1-4} alkyl,

R_1 includes the single template site for bonding a template polynucleotide to the scaffold, R^4 is selected from an optionally substituted C_1 - C_{20} alkyl, an optionally substituted C_1 - C_{20} alkenyl, an optionally substituted C_1 - C_{20} alkynyl, an optionally substituted C_1 - C_{20} oxaalkyl, an optionally substituted C_1 - C_{20} thiaalkyl, and an optionally substituted C_1 - C_{20} azaalkyl, wherein substituted comprises substitution with one or more of a C_1 - C_{20} alkyl, a double-bonded oxygen, and a hydroxyl group, and R^3 includes the accessory site for bonding accessory oligonucleotides.

2.—The nanoparticle of claim 1, wherein the single template site comprises a covalent template bonding site:

3.2. ~~The nanoparticle of claim 2, and optionally~~ wherein the covalent template bonding site is selected from amine-NHS ester bonding site, an amine-imidoester bonding site, an amine-pentofluorophenyl ester bonding site, an amine-hydroxymethyl phosphine bonding site, a carboxyl-carbodiimide bonding site, a thiol-maleimide bonding site, a thiol-haloacetyl bonding site, a thiol-pyridyl disulfide bonding site, a thiol-thiosulfonate bonding site, a thiol-vinyl sulfone bonding site, an aldehyde-hydrazide bonding site, an aldehyde-alkoxyamine bonding site, an aldehyde-NHS ester bonding site, a hydroxy-isocyanate bonding site, an azide-alkyne bonding site, an azide-phosphine bonding site, a

transcyclooctene-tetrazine bonding site, a norbornene-tetrazine bonding site, an azide-cyclooctyne bonding site, an azide-norbornene bonding site, an oxime bonding site, a SpyTag-SpyCatcher bonding site, a Snap-tag-O⁶-Benzylguanine bonding site, a CLIP-tag-O²-benzylcytosine bonding site, and a sortase-coupling bonding site.

4.——The nanoparticle of any one of claim 1, wherein the single template site comprises a noncovalent template bonding site-

5.——~~The nanoparticle of claim 4, and optionally~~ wherein the noncovalent template bonding site comprises a polynucleotide hybridization site-

6.3. ~~The nanoparticle of claim 4, or~~ wherein the noncovalent template bonding site comprises a noncovalent peptide binding site and the noncovalent peptide binding site is selected from a coiled-coil bonding site and an avidin-biotin bonding site.

7.——The nanoparticle of any ~~one of claims 1 through 6~~ preceding claim, wherein the plurality of accessory sites for bonding accessory oligonucleotides to the scaffold comprise covalent accessory oligonucleotide bonding sites-

8.4. ~~The nanoparticle of claim 7, and optionally~~ wherein the covalent accessory oligonucleotide bonding sites are selected from amine-NHS ester bonding sites, amine-imidoester bonding sites, amine-pentofluorophenyl ester bonding sites, amine-hydroxymethyl phosphine bonding sites, carboxyl-carbodiimide bonding sites, thiol-maleimide bonding sites, thiol-haloacetyl bonding sites, thiol-pyridyl disulfide bonding sites, thiol-thiosulfonate bonding sites, thiol-vinyl sulfone bonding sites, aldehyde-hydrazide bonding sites, aldehyde-alkoxyamine bonding sites, hydroxy-isocyanate bonding sites, azide-alkyne bonding sites, azide-phosphine bonding sites, transcyclooctene-tetrazine bonding sites, norbornene-tetrazine bonding sites, an azide-cyclooctyne bonding sites, azide-norbornene bonding sites, oxime bonding sites, SpyTag-SpyCatcher bonding sites, Snap-tag-O⁶-Benzylguanine bonding sites, CLIP-tag-O²-benzylcytosine bonding sites, sortase-coupling bonding sites, and any combination of two or more of the foregoing.

9.——The nanoparticle of any one of claims 1 through ~~6~~ 3, wherein the accessory oligonucleotide bonding sites comprise noncovalent accessory oligonucleotide bonding sites-

10.——~~The nanoparticle of claim 9, and optionally~~ wherein the noncovalent accessory oligonucleotide bonding sites comprise polynucleotide hybridization sites-

11.5. ~~The nanoparticle of claim 9, or~~ wherein the noncovalent accessory oligonucleotide bonding sites comprise noncovalent peptide binding sites and the

noncovalent peptide binding sites are selected from one or both of coiled-coil bonding sites and avidin-biotin bonding sites.

~~12.~~—The nanoparticle of any one of claims 1 through ~~11~~5, further comprising a single template polynucleotide bonded to the single template site-

~~13.~~—~~The nanoparticle of any one of claims 1 through 12,~~ optionally further comprising a plurality of accessory oligonucleotides bonded to the plurality of accessory sites-

~~14.6.~~ The nanoparticle of any one of claims 1 through 13, optionally wherein the nanoparticle is at least about 10 nm in diameter.

~~15.7.~~ A method, comprising bonding a single template polynucleotide to the single template site of the nanoparticle of any one of claims 1 through 146.

~~16.8.~~ A method, comprising bonding a plurality of accessory oligonucleotides to the plurality of accessory sites of the nanoparticle of any one of claims 1 through 157.

~~17.~~—The method of claim ~~15~~7 or ~~16~~8, further comprising synthesizing one or more scaffold-attached copies selected from copies of the template polynucleotide, copies of the polynucleotides complementary to the template polynucleotide, and copies of both, wherein the scaffold-attached copies extend from the accessory oligonucleotides-

~~18.~~—~~The method of any one of claims 15-17,~~ optionally further comprising attaching the scaffold to a substrate, wherein attaching comprises hybridizing accessory oligonucleotides with oligonucleotides attached to the substrate.

~~19.~~—~~The method of claim 18,~~ and optionally wherein the substrate comprises a plurality of nanowells and the oligonucleotides attached to the substrate are attached within the plurality of nanowells-

~~20.9.~~ The method of claim 19, optionally, wherein no more than one scaffold binds within any one of the nanowells.

~~21.10.~~ The method of any one of claims 18 through 20claim 9 further comprising synthesizing one or more substrate-attached copies selected from copies of the template polynucleotide, copies of the polynucleotides complementary to the template polynucleotide, and copies of both, wherein the substrate-attached copies extend from oligonucleotides attached to a substrate.

~~22.11.~~ The method of claim 179 or ~~21~~10, further comprising sequencing at least one of scaffold-attached copies and substrate-attached copies, wherein sequencing comprises sequencing by synthesis.

23.—A nanoparticle, comprising

a scaffold, a single template site for bonding a template polynucleotide to the scaffold selected from a covalent template bonding site and a noncovalent template bonding site, and a plurality of accessory sites for bonding accessory oligonucleotides to the scaffold selected from covalent accessory oligonucleotide bonding sites and noncovalent accessory oligonucleotide bonding sites, wherein

the scaffold comprises a dendrimer wherein the dendrimer comprises from 2 to 10 generations of constitutional repeating units, the constitutional repeating units comprise lysine wherein a lysine of an upstream generation forms a peptide bond with a first lysine of an immediately downstream generation and an isopeptide bond with a second lysine of the immediately downstream generation,

the single template site extends from the C-terminal end of the lysine of the first generation of the dendrimer and the plurality of accessory sites extend from NH₂ groups of lysines of the last generation of the dendrimer.

24.—The nanoparticle of claim 23, wherein the single template site comprises a covalent template bonding site.

25.—The nanoparticle of claim 24, wherein the covalent template bonding site is selected from an amine-NHS-ester bonding site, an amine-imidoester bonding site, an amine-pentofluorophenyl ester bonding site, an amine-hydroxymethyl-phosphine bonding site, a carboxyl-carbodiimide bonding site, a thiol-maleimide bonding site, a thiol-haloacetyl bonding site, a thiol-pyridyl-disulfide bonding site, a thiol-thiosulfonate bonding site, a thiol-vinyl-sulfone bonding site, an aldehyde-hydrazide bonding site, an aldehyde-alkoxyamine bonding site, a hydroxy-isocyanate bonding site, an azide-alkyne bonding site, an azide-phosphine bonding site, a trans-cyclooctene-tetrazine bonding site, a norbornene-tetrazine bonding site, an azide-cyclooctyne bonding site, an azide-norbornene bonding site, an oxime bonding site, a SpyTag-SpyCatcher bonding site, a Snap-tag-O⁶-Benzylguanine bonding site, a CLIP-tag-O²-benzyleytosine bonding site, and a sortase-coupling bonding site.

26.—The nanoparticle of any one of claim 23, wherein the single template site comprises a noncovalent template bonding site.

27.—The nanoparticle of claim 26, wherein the noncovalent template bonding site comprises a polynucleotide hybridization site.

28.—The nanoparticle of claim 28, wherein the noncovalent template bonding site comprises a noncovalent peptide binding site and the noncovalent peptide binding site is selected from a coiled-coil bonding site and an avidin-biotin bonding site.

29.—The nanoparticle of any one of claims 23 through 28, wherein the plurality of accessory sites for bonding accessory oligonucleotides to the scaffold comprise covalent accessory oligonucleotide bonding sites.

30.—The nanoparticle of claim 29, wherein the covalent accessory oligonucleotide bonding sites are selected from amine-NHS ester bonding sites, amine-imidoester bonding sites, amine-pentofluorophenyl ester bonding sites, amine-hydroxymethyl phosphine bonding sites, carboxyl-carbodiimide bonding sites, thiol-maleimide bonding sites, thiol-haloacetyl bonding sites, thiol-pyridyl disulfide bonding sites, thiol-thiosulfonate bonding sites, thiol-vinyl sulfone bonding sites, aldehyde-hydrazide bonding sites, aldehyde-alkoxyamine bonding sites, hydroxy-isocyanate bonding sites, azide-alkyne bonding sites, azide-phosphine bonding sites, transcyclooctene-tetrazine bonding sites, norbornene-tetrazine bonding sites, an azide-cyclooctyne bonding sites, azide-norbornene bonding sites, oxime bonding sites, SpyTag-SpyCatcher bonding sites, Snap-tag-O⁶-Benzylguanine bonding sites, CLIP-tag-O²-benzylcytosine bonding sites, sortase-coupling bonding sites, and any combination of two or more of the foregoing.

31.—The nanoparticle of any one of claims 23 through 28, wherein the accessory oligonucleotide bonding sites comprise noncovalent accessory oligonucleotide bonding sites.

32.—The nanoparticle of claim 31, wherein the noncovalent accessory oligonucleotide bonding sites comprise polynucleotide hybridization sites.

33.—The nanoparticle of claim 31, wherein the noncovalent accessory oligonucleotide bonding sites comprise noncovalent peptide binding sites and the noncovalent peptide binding sites are selected from one or both of coiled-coil bonding sites and avidin-biotin bonding sites.

34.—The nanoparticle of any one of claims 23 through 33, further comprising a single template polynucleotide bonded to the single template site.

35.—The nanoparticle of any one of claims 23 through 34, further comprising a plurality of accessory oligonucleotides bonded to the plurality of accessory sites.

36.—The nanoparticle of any one of claims 23 through 35, wherein the nanoparticle is at least about 10 nm in diameter.

37.—A method, comprising bonding a single template polynucleotide to the single template site of the nanoparticle of any one of claims 23 through 36.

~~38. A method, comprising bonding a plurality of accessory oligonucleotides to the plurality of accessory sites of the nanoparticle of any one of claims 23 through 37.~~

~~39. The method of claim 37 or 38, further comprising synthesizing one or more scaffold-attached copies selected from copies of the template polynucleotide, copies of the polynucleotides complementary to the template polynucleotide, and copies of both, wherein the scaffold-attached copies extend from the accessory oligonucleotides.~~

~~40. The method of any one of claims 37-39, further comprising attaching the scaffold to a substrate, wherein attaching comprises hybridizing accessory oligonucleotides with oligonucleotides attached to the substrate.~~

~~41. The method of claim 40, wherein the substrate comprises a plurality of nanowells and the oligonucleotides attached to the substrate are attached within the plurality of nanowells.~~

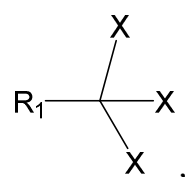
~~42. The method of claim 41, wherein no more than one scaffold binds within any one of the nanowells.~~

~~43. The method of any one of claims 40 through 42 further comprising synthesizing one or more substrate-attached copies selected from copies of the template polynucleotide, copies of the polynucleotides complementary to the template polynucleotide, and copies of both, wherein the substrate-attached copies extend from oligonucleotides attached to a substrate.~~

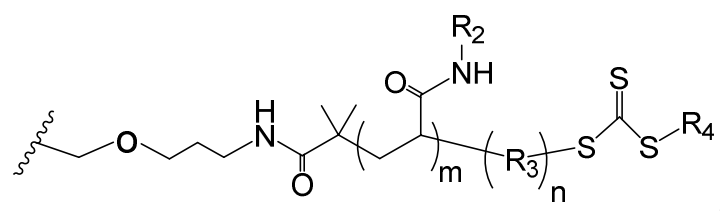
~~44. The method of claim 39 or 43, further comprising sequencing at least one of scaffold-attached copies and substrate-attached copies, wherein sequencing comprises sequencing by synthesis.~~

~~45.12.~~ A nanoparticle, comprising
a scaffold, a single template site for bonding a template polynucleotide to the scaffold selected from a covalent template bonding site and a noncovalent template bonding site, and a plurality of accessory sites for bonding accessory oligonucleotides to the scaffold selected from covalent accessory oligonucleotide bonding sites and noncovalent accessory oligonucleotide bonding sites, wherein

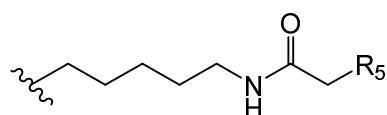
the scaffold is a compound of Formula IV:



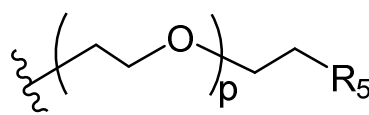
each X is a compound of formula V:



wherein R_2 is selected from Formula VIa:



and Formula VIb:



wherein p is an

integer selected from 1 to 20, and R_5 comprises the accessory site for bonding accessory

oligonucleotides, R_3 is selected from a direct bond,

, , and , m is an integer from 1 to 20,000 and n is an integer from 1 to 100,000,

R^1 comprises the single template site for bonding a template polynucleotide to the scaffold, R^4 is selected from an optionally substituted C_1 - C_{20} alkyl, an optionally substituted C_1 - C_{20} alkenyl, an optionally substituted C_1 - C_{20} alkynyl, an optionally substituted C_1 - C_{20} oxaalkyl, an optionally substituted C_1 - C_{20} thiaalkyl, and an optionally substituted C_1 - C_{20} azaalkyl, wherein substituted comprises substitution with one or more of a C_1 - C_{20} alkyl, a double-bonded oxygen, and a hydroxyl group, and R^3 comprises the accessory site for bonding accessory oligonucleotides.

46.—The nanoparticle of claim 4512, wherein the single template site comprises a covalent template bonding site:

47.13. The nanoparticle of claim 46, and optionally wherein the covalent template bonding site is selected from an amine-NHS ester bonding site, an amine-imidoester bonding site, an amine-pentofluorophenyl ester bonding site, an amine-hydroxymethyl phosphine bonding site, a carboxyl-carbodiimide bonding site, a thiol-maleimide bonding site, a thiol-haloacetyl bonding site, a thiol-pyridyl disulfide bonding site, a thiol-thiosulfonate bonding site, a thiol-vinyl sulfone bonding site, an aldehyde-hydrazide bonding

site, an aldehyde-alkoxyamine bonding site, a hydroxy-isocyanate bonding site, an azide-alkyne bonding site, an azide-phosphine bonding site, a transcyclooctene-tetrazine bonding site, a norbornene-tetrazine bonding site, an azide-cyclooctyne bonding site, an azide-norbornene bonding site, an oxime bonding site, a SpyTag-SpyCatcher bonding site, a Snap-tag-O⁶-Benzylguanine bonding site, a CLIP-tag-O²-benzylcytosine bonding site, and a sortase-coupling bonding site.

48.—The nanoparticle of ~~any one of claim 45~~12, wherein the single template site comprises a noncovalent template bonding site.

49.—The nanoparticle of claim 48, and optionally wherein the noncovalent template bonding site comprise a polynucleotide hybridization site.

~~50.14. The nanoparticle of claim 48, or~~ 50.14. The nanoparticle of claim 48, or wherein the noncovalent template bonding site comprises a noncovalent peptide binding site and the noncovalent peptide binding site is selected from one or both of a coiled-coil bonding site and an avidin-biotin bonding site.

51.—The nanoparticle of any one of claims ~~45~~12 through ~~50~~14, wherein the plurality of accessory sites for bonding accessory oligonucleotides to the scaffold comprise covalent accessory oligonucleotide bonding sites.

~~52.15. The nanoparticle of claim 51, optionally~~ 52.15. The nanoparticle of claim 51, optionally wherein the covalent accessory oligonucleotide bonding sites are selected from amine-NHS ester bonding sites, amine-imidoester bonding sites, amine-pentofluorophenyl ester bonding sites, amine-hydroxymethyl phosphine bonding sites, carboxyl-carbodiimide bonding sites, thiol-maleimide bonding sites, thiol-haloacetyl bonding sites, thiol-pyridyl disulfide bonding sites, thiol-thiosulfonate bonding sites, thiol-vinyl sulfone bonding sites, aldehyde-hydrazide bonding sites, aldehyde-alkoxyamine bonding sites, hydroxy-isocyanate bonding sites, azide-alkyne bonding sites, azide-phosphine bonding sites, transcyclooctene-tetrazine bonding sites, norbornene-tetrazine bonding sites, an azide-cyclooctyne bonding sites, azide-norbornene bonding sites, oxime bonding sites, SpyTag-SpyCatcher bonding sites, Snap-tag-O⁶-Benzylguanine bonding sites, CLIP-tag-O²-benzylcytosine bonding sites, sortase-coupling bonding sites, and any combination of two or more of the foregoing.

53.—The nanoparticle of any one of claims ~~45~~12 through ~~50~~14, wherein the accessory oligonucleotide bonding sites comprises noncovalent accessory oligonucleotide bonding sites.

54.—The nanoparticle of claim 53, and optionally wherein the noncovalent accessory oligonucleotide bonding sites comprise polynucleotide hybridization sites.

~~55.16.~~ ~~The nanoparticle of claim 53, or~~ wherein the noncovalent accessory oligonucleotide bonding sites comprise noncovalent peptide binding sites and the noncovalent peptide binding sites are selected from one or both of coiled-coil bonding sites and avidin-biotin bonding sites.

56.—The nanoparticle of any one of claims ~~45~~12 through ~~55~~16, further comprising a single template polynucleotide bonded to the single template site:

~~57.—The nanoparticle of any one of claims 45 through 56, optionally~~ further comprising a plurality of accessory oligonucleotides bonded to the plurality of accessory sites:

~~58.17.~~ ~~The nanoparticle of any one of claims 45 through 57, optionally~~ wherein the nanoparticle is at least about 10 nm in diameter.

~~59.18.~~ A method, comprising bonding a single template polynucleotide to the single template site of the nanoparticle of any one of claims ~~45~~12 through ~~58~~17.

~~60.19.~~ A method, comprising bonding a plurality of accessory oligonucleotides to the plurality of accessory sites of the nanoparticle of any one of claims ~~45~~12 through ~~59~~18.

~~61.20.~~ The method of claim ~~59~~18 or ~~60~~19, further comprising synthesizing one or more scaffold-attached copies selected from copies of the template polynucleotide, copies of the polynucleotides complementary to the template polynucleotide, and copies of both, wherein the scaffold-attached copies extend from the accessory oligonucleotides.

~~62.21.~~ The method of any one of claims ~~59~~18-~~61~~20, further comprising attaching the scaffold to a substrate, wherein attaching comprises hybridizing accessory oligonucleotides with oligonucleotides attached to the substrate.

~~63.—~~The method of claim ~~62~~21, wherein the substrate comprises a plurality of nanowells and the oligonucleotides attached to the substrate are attached within the plurality of nanowells:

~~64.22.~~ ~~The method of claim 63, and optionally~~ wherein no more than one scaffold binds within any one of the nanowells.

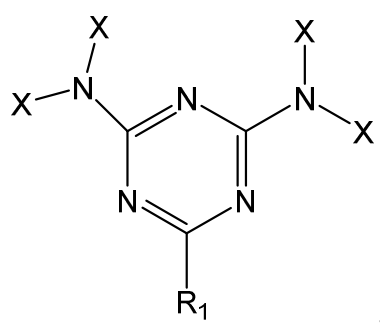
~~65.23.~~ The method of ~~any one of claims 62 through 64~~ claim 21 or claim 22 further comprising synthesizing one or more substrate-attached copies selected from copies of the template polynucleotide, copies of the polynucleotides complementary to the template polynucleotide, and copies of both, wherein the substrate-attached copies extend from oligonucleotides attached to a substrate.

~~66.24.~~ The method of claim ~~64~~20 or ~~65~~23, further comprising sequencing at least one of scaffold-attached copies and substrate-attached copies, wherein sequencing comprises sequencing by synthesis.

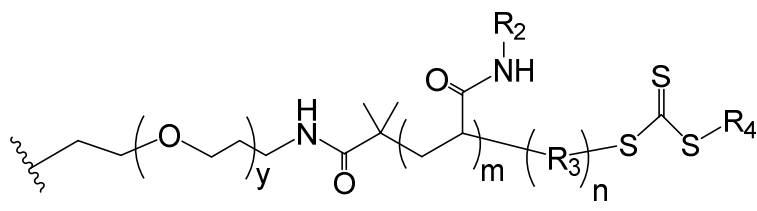
~~67.25.~~ A nanoparticle, comprising

a scaffold, a single template site for bonding a template polynucleotide to the scaffold selected from a covalent template bonding site and a noncovalent template bonding site, and a plurality of accessory sites for bonding accessory oligonucleotides to the scaffold selected from covalent accessory oligonucleotide bonding sites and noncovalent accessory oligonucleotide bonding sites, wherein

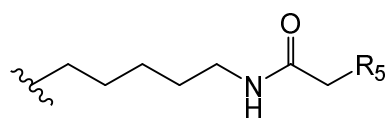
the scaffold is a compound of Formula VII:



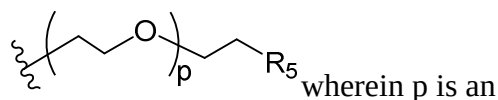
each X is a compound of formula VIII:



wherein y is an integer from 1 to 20, R₂ is selected from Formula IXa:

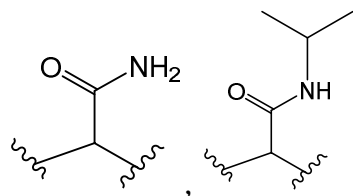


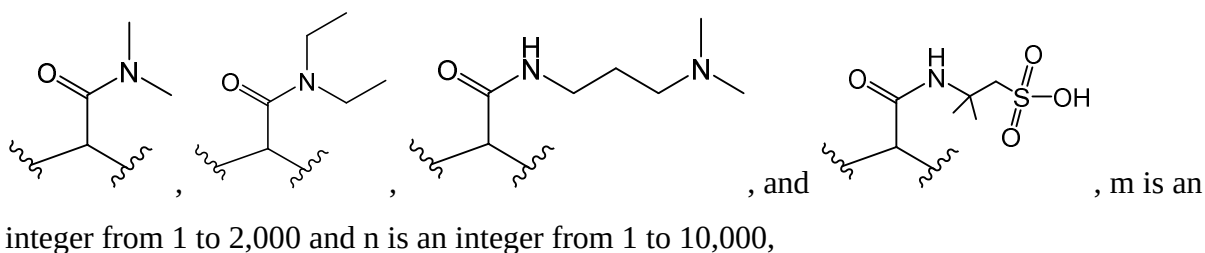
and Formula IXb:



wherein p is an integer selected from 1 to 20, and R₅ comprises the accessory site for bonding accessory

oligonucleotides, R₃ is selected from a direct bond,





R¹ comprises the single template site for bonding a template polynucleotide to the scaffold, R⁴ is selected from an optionally substituted C₁-C₂₀ alkyl, an optionally substituted C₁-C₂₀ alkenyl, an optionally substituted C₁-C₂₀ alkynyl, an optionally substituted C₁-C₂₀ oxaalkyl, an optionally substituted C₁-C₂₀ thiaalkyl, and an optionally substituted C₁-C₂₀ azaalkyl, wherein substituted comprises substitution with one or more of a C₁-C₂₀ alkyl, a double-bonded oxygen, and a hydroxyl group, and R³ comprises the accessory site for bonding accessory oligonucleotides.

68.—The nanoparticle of claim 6725, wherein the single template site comprises a covalent template bonding site:

69.26. ~~The nanoparticle of claim 68,~~ optionally wherein the covalent template bonding site is selected from an amine-NHS ester bonding site, an amine-imidoester bonding site, an amine-pentofluorophenyl ester bonding site, an amine-hydroxymethyl phosphine bonding site, a carboxyl-carbodiimide bonding site, a thiol-maleimide bonding site, a thiol-haloacetyl bonding site, a thiol-pyridyl disulfide bonding site, a thiol-thiosulfonate bonding site, a thiol-vinyl sulfone bonding site, an aldehyde-hydrazide bonding site, an aldehyde-alkoxyamine bonding site, a hydroxy-isocyanate bonding site, an azide-alkyne bonding site, an azide-phosphine bonding site, a transcyclooctene-tetrazine bonding site, a norbornene-tetrazine bonding site, an azide-cyclooctyne bonding site, an azide-norbornene bonding site, an oxime bonding site, a SpyTag-SpyCatcher bonding site, a Snap-tag-O⁶-Benzylguanine bonding site, a CLIP-tag-O²-benzylcytosine bonding site, and a sortase-coupling bonding site.

70.—The nanoparticle of any one of claim 6725, wherein the single template site comprises a noncovalent template bonding site:

71.—~~The nanoparticle of claim 70,~~ and optionally wherein the noncovalent template bonding site comprises a polynucleotide hybridization site:

72.27. ~~The nanoparticle of claim 70,~~ or wherein the noncovalent template bonding site comprises a noncovalent peptide binding site and the noncovalent peptide binding site is selected from a coiled-coil bonding site and an avidin-biotin bonding site.

73.—The nanoparticle of any one of claims ~~67~~25 through ~~72~~27, wherein the plurality of accessory sites for bonding accessory oligonucleotides to the scaffold comprise covalent accessory oligonucleotide bonding sites.

~~74.28. The nanoparticle of claim 73, optionally~~ wherein the covalent accessory oligonucleotide bonding sites are selected from amine-NHS ester bonding sites, amine-imidoester bonding sites, amine-pentofluorophenyl ester bonding sites, amine-hydroxymethyl phosphine bonding sites, carboxyl-carbodiimide bonding sites, thiol-maleimide bonding sites, thiol-haloacetyl bonding sites, thiol-pyridyl disulfide bonding sites, thiol-thiosulfonate bonding sites, thiol-vinyl sulfone bonding sites, aldehyde-hydrazide bonding sites, aldehyde-alkoxyamine bonding sites, hydroxy-isocyanate bonding sites, azide-alkyne bonding sites, azide-phosphine bonding sites, transcyclooctene-tetrazine bonding sites, norbornene-tetrazine bonding sites, an azide-cyclooctyne bonding sites, azide-norbornene bonding sites, oxime bonding sites, SpyTag-SpyCatcher bonding sites, Snap-tag-O⁶-Benzylguanine bonding sites, CLIP-tag-O²-benzylcytosine bonding sites, sortase-coupling bonding sites, and any combination of two or more of the foregoing.

~~75.29. The nanoparticle of any one of claims 6725 through 7227, wherein the~~ accessory oligonucleotide bonding sites comprises noncovalent accessory oligonucleotide bonding sites.

76.—The nanoparticle of claim ~~75~~29, wherein the noncovalent accessory oligonucleotide bonding sites comprise polynucleotide hybridization sites.

~~77.30. The nanoparticle of claim 75, or~~ wherein the noncovalent accessory oligonucleotide bonding sites comprise noncovalent peptide binding sites and the noncovalent peptide binding sites are selected from one or both of coiled-coil bonding sites and avidin-biotin bonding sites.

78.—The nanoparticle of any one of claims ~~67~~25 through ~~77~~30, further comprising a single template polynucleotide bonded to the single template site.

~~79. The nanoparticle of any one of claims 67 through 78, optionally~~ further comprising a plurality of accessory oligonucleotides bonded to the plurality of accessory sites.

~~80.31. The nanoparticle of any one of claims 67 through 79, and optionally~~ wherein the nanoparticle is at least about 10 nm in diameter.

~~81.32. A method, comprising bonding a single template polynucleotide to the~~ single template site of the nanoparticle of any one of claims ~~67~~25 through ~~80~~31.

~~82.33.~~ A method, comprising bonding a plurality of accessory oligonucleotides to the plurality of accessory sites of the nanoparticle of any one of claims ~~67~~25 through ~~81~~32.

~~83.34.~~ The method of claim ~~81~~32 or ~~82~~33, further comprising synthesizing one or more scaffold-attached copies selected from copies of the template polynucleotide, copies of the polynucleotides complementary to the template polynucleotide, and copies of both, wherein the scaffold-attached copies extend from the accessory oligonucleotides.

~~84.35.~~ The method of any one of claims ~~81~~32-~~83~~34, further comprising attaching the scaffold to a substrate, wherein attaching comprises hybridizing accessory oligonucleotides with oligonucleotides attached to the substrate.

~~85.~~—The method of claim ~~84~~35, wherein the substrate comprises a plurality of nanowells and the oligonucleotides attached to the substrate are attached within the plurality of nanowells.

~~86.36.~~ ~~The method of claim 85,~~ optionally wherein no more than one scaffold binds within any one of the nanowells.

~~87.37.~~ The method of ~~any one of claims 84 through 86~~ claim 35 or 36 further comprising synthesizing one or more substrate-attached copies selected from copies of the template polynucleotide, copies of the polynucleotides complementary to the template polynucleotide, and copies of both, wherein the substrate-attached copies extend from oligonucleotides attached to a substrate.

~~88.38.~~ The method of claim ~~83~~34 or ~~87~~37, further comprising sequencing at least one of scaffold-attached copies and substrate-attached copies, wherein sequencing comprises sequencing by synthesis.

39. A nanoparticle, comprising
a scaffold, a single template site for bonding a template polynucleotide to the scaffold selected from a covalent template bonding site and a noncovalent template bonding site, and a plurality of accessory sites for bonding accessory oligonucleotides to the scaffold selected from covalent accessory oligonucleotide bonding sites and noncovalent accessory oligonucleotide bonding sites, wherein
the scaffold comprises a dendrimer wherein the dendrimer comprises from 2 to 10 generations of constitutional repeating units, the constitutional repeating units comprise lysine wherein a lysine of an upstream generation forms a peptide bond with a first lysine of an immediately downstream generation and an isopeptide bond with a second lysine of the immediately downstream generation,

the single template site extends from the C-terminal end of the lysine of the first generation of the dendrimer and the plurality of accessory sites extend from NH₂ groups of lysines of the last generation of the dendrimer.

40. The nanoparticle of claim 39, wherein the single template site comprises a covalent template bonding site, optionally wherein the covalent template bonding site is selected from an amine-NHS ester bonding site, an amine-imidoester bonding site, an amine-pentofluorophenyl ester bonding site, an amine-hydroxymethyl phosphine bonding site, a carboxyl-carbodiimide bonding site, a thiol-maleimide bonding site, a thiol-haloacetyl bonding site, a thiol-pyridyl disulfide bonding site, a thiol-thiosulfonate bonding site, a thiol-vinyl sulfone bonding site, an aldehyde-hydrazide bonding site, an aldehyde-alkoxyamine bonding site, a hydroxy-isocyanate bonding site, an azide-alkyne bonding site, an azide-phosphine bonding site, a transcyclooctene-tetrazine bonding site, a norbornene-tetrazine bonding site, an azide-cyclooctyne bonding site, an azide-norbornene bonding site, an oxime bonding site, a SpyTag-SpyCatcher bonding site, a Snap-tag-O⁶-Benzylguanine bonding site, a CLIP-tag-O²-benzylcytosine bonding site, and a sortase-coupling bonding site.

41. A method, comprising bonding a single template polynucleotide to the single template site of the nanoparticle of any one of claims 39 through 40.

42. A method, comprising bonding a plurality of accessory oligonucleotides to the plurality of accessory sites of the nanoparticle of any one of claims 39 through 41.