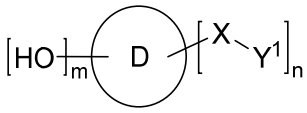
CLAIMS

What is claimed is:

1. A composition comprising a carrier and functionalized dendrimers of Formula (**I-A**):



(**I-A**),

wherein:

D is a dendrimer selected from the group consisting of poly(amidoamine) (PAMAM) polymers, polypropylamine (POPAM) polymers, polyethylenimine polymers, polylysine polymers, polyester polymers, iptycene polymers, aliphatic poly(ether) polymers, aromatic polyether polymers, 2,2-bis(hydroxymethyl)propionic acid (bis-MPA) polymers, and combinations thereof;

X is NH;

Y^1 is optionally substituted alkylene, optionally substituted alkenylene, optionally substituted alkynylene, or a covalent bond;

m is an integer from 16 to 4096, inclusive; and

n is an integer from 1 to 100, inclusive,

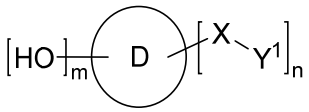
wherein the polydispersity value of the functionalized dendrimers in the composition is less than or equal to 1.10.

2. The composition of claim 1, wherein:

(i) the polydispersity value of the functionalized dendrimers in the composition is less than or equal to 1.05, less than or equal to 1.04, or less than or equal to 1.03;

(ii) the composition comprises at least 10 grams, at least 50 grams, at least 100 grams, or at least 150 grams of the functionalized dendrimer; or wherein the composition comprises 10-200 grams, 20-200 grams, 50-200 grams, or 100-200 grams of the functionalized dendrimer.

3. A method of synthesizing a functionalized dendrimer of Formula (**I-A**):



(**I-A**),

wherein:

D is a dendrimer selected from the group consisting of poly(amidoamine) (PAMAM) polymers, polypropylamine (POPAM) polymers, polyethylenimine polymers, polylysine polymers, polyester polymers, iptycene polymers, aliphatic poly(ether) polymers, aromatic polyether polymers, 2,2-bis(hydroxymethyl)propionic acid (bis-MPA) polymers, and combinations thereof;

X is NH;

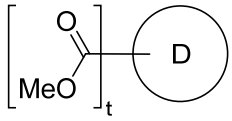
Y^1 is optionally substituted alkylene, optionally substituted alkenylene, optionally substituted alkynylene, or a covalent bond;

m is an integer from 16 to 4096, inclusive; and

n is an integer from 1 to 100, inclusive;

the method comprising:

reacting a dendrimer of Formula (**II-A**):



(**II-A**),

under suitable conditions to form the functionalized dendrimer of Formula **(I-A)**;

wherein:

D is a dendrimer selected from the group consisting of poly(amidoamine) (PAMAM) polymers, polypropylamine (POPAM) polymers, polyethylenimine polymers, polylysine polymers, polyester polymers, iptycene polymers, aliphatic poly(ether) polymers, aromatic polyether polymers, 2,2-bis(hydroxymethyl)propionic acid (bis-MPA) polymers, and combinations thereof;

t is an integer from 16 to 4096, inclusive;

with one or more amines, wherein each amine is of the formula H_2NR^1,

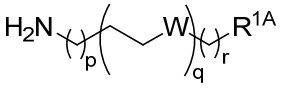
wherein R^1 is optionally substituted alkylene, optionally substituted alkenylene, optionally substituted alkynylene, or a covalent bond.

4. The method of claim 3, wherein n is 1, n is 2, n is 3, n is 4, or n is 10.

5. The method of claim 3 or 4, wherein m is 61 or 54.

6. The method of any one of claims 3-5, wherein at least one instance of R^1 is optionally substituted alkylene.

7. The method of any one of claims 3-6, wherein at least one instance of the one or more amines is a compound of Formula (A):



(**A**),

wherein:

R^{1A} is halogen, optionally substituted acyl, optionally substituted alkenylene, optionally substituted alkynylene, optionally substituted acetylene, optionally substituted carbocyclyl, optionally substituted heterocyclyl, optionally substituted aryl, optionally substituted heteroaryl, -CH(=N)(OH)R^{D1}, -CN, -NO_2, -OR^{D1}, -N(R^{D1a})$_2$, -SO_2OR^{D1}, or -SR^{D1}, wherein R^{D1} is independently hydrogen, optionally substituted acyl, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted carbocyclyl, optionally substituted heterocyclyl, optionally substituted aryl, optionally substituted heteroaryl, or an oxygen protecting group when attached to an oxygen atom, or a sulfur protecting group when attached to a sulfur atom;

wherein each occurrence of R^{D1a} is independently hydrogen, optionally substituted acyl, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted carbocyclyl, optionally substituted heterocyclyl, optionally substituted aryl, optionally substituted heteroaryl, or a nitrogen protecting group; or optionally two instances of R^{D1a} are taken together with their intervening atoms to form a substituted or unsubstituted heterocyclic or substituted or unsubstituted heteroaryl ring;

W is –O– or –CH_2–, as valency permits;

p is 0, 1, 2, or 3;

q is an integer between 1-100,000, inclusive; and

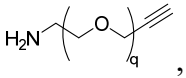
r is 0, 1, 2, 3, 4, 5, or 6.

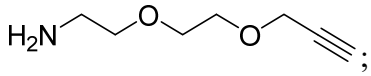
8. The method of claim 7, wherein:

(i) W is –O–, optionally wherein W is –O– and q is an integer between 1-100,000, inclusive; or

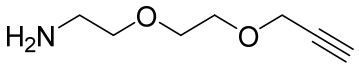
(ii) W is –CH_2– and q is an integer between 1-10,000, inclusive.

9. The method of any one of claims 3-8, wherein:

(i) at least one instance of the one or more amines is a PEG-alkyne of formula: , wherein q is 1, 2, 3, 4, 5, or 6;

(ii) at least one instance of the one or more amines is a PEG-alkyne of formula: ;

(iii) at least one instance of the one or more amines is ethanolamine; and/or

(iv) the dendrimer of Formula (**II-A**) is reacted with both ethanolamine and the PEG-alkyne of formula: , optionally wherein a ratio of the ethanolamine to the PEG-Alkyne is 9.42:1 or 2.2:1.

10. The method of claim 9, wherein:

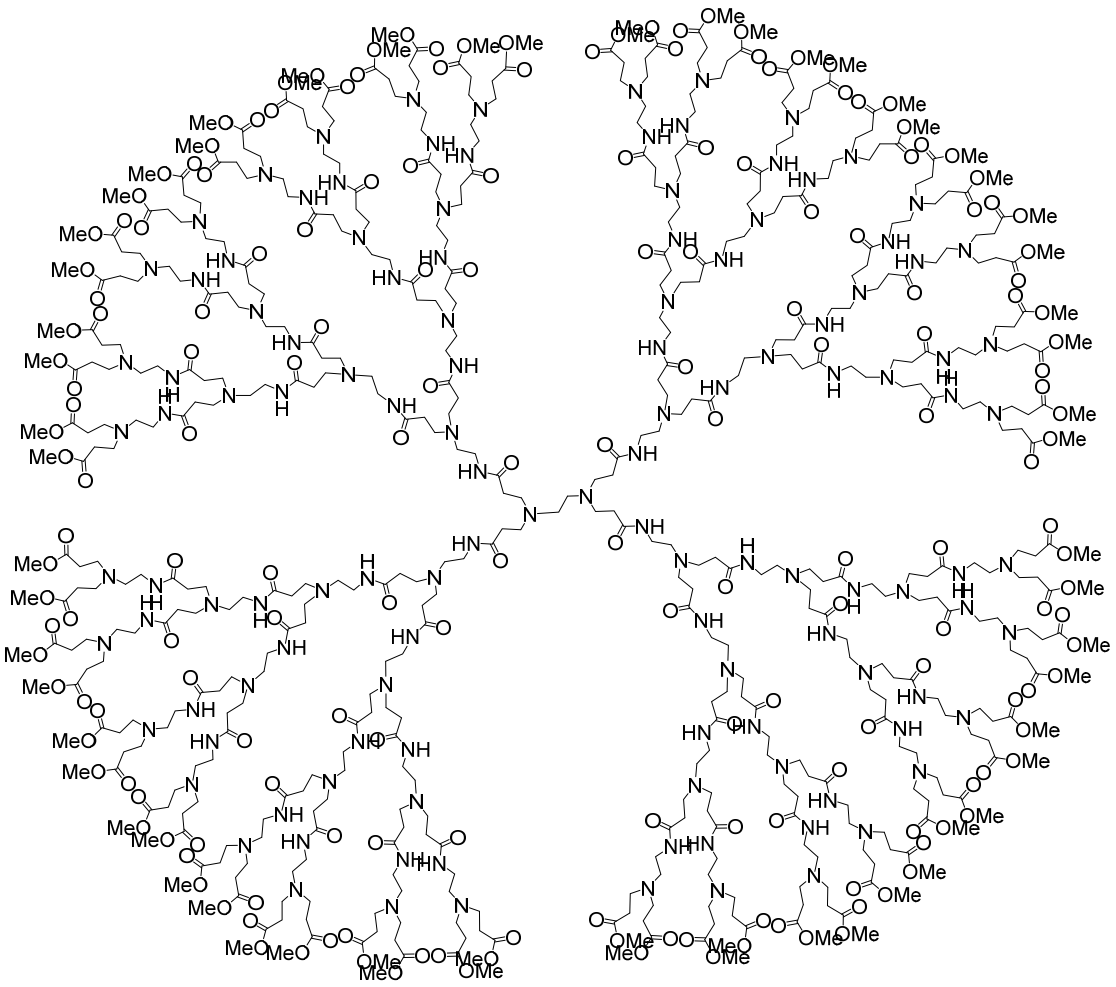
(i) a ratio of the PEG-Alkyne to the dendrimer of Formula (**II-A**) is approximately 150:1, optionally wherein the ratio of the PEG-Alkyne to the dendrimer of Formula (**II-A**) is approximately 150:1, the ratio of the ethanolamine to the PEG-Alkyne is 9.42:1, and n is 3;

(ii) a ratio of the PEG-Alkyne to the dendrimer of Formula (**II-A**) is approximately 500:1, optionally wherein the ratio of the PEG-Alkyne to the dendrimer of Formula (**II-A**) is approximately 500:1, the ratio of the ethanolamine to the PEG-Alkyne is 2.2:1, and n is 10; or

(iii) the ratio of the PEG-Alkyne to the dendrimer of Formula (**II-A**) is 495:1.

11. The method of any one of claims 3-10, wherein D is PAMAM.

12. The method of any one of claims 3-11, wherein the dendrimer of Formula (**II-A**) is of formula:



(PAMAM G3.5).

13. The method of any one of claims 3-12, wherein the polydispersity value of the functionalized dendrimer of Formula (**I-A**) is about 1.00 to about 1.05; optionally wherein the polydispersity value of the functionalized dendrimer of Formula (**I-A**) is about 1.03.

14. The method of any one of claims 3-13, wherein:

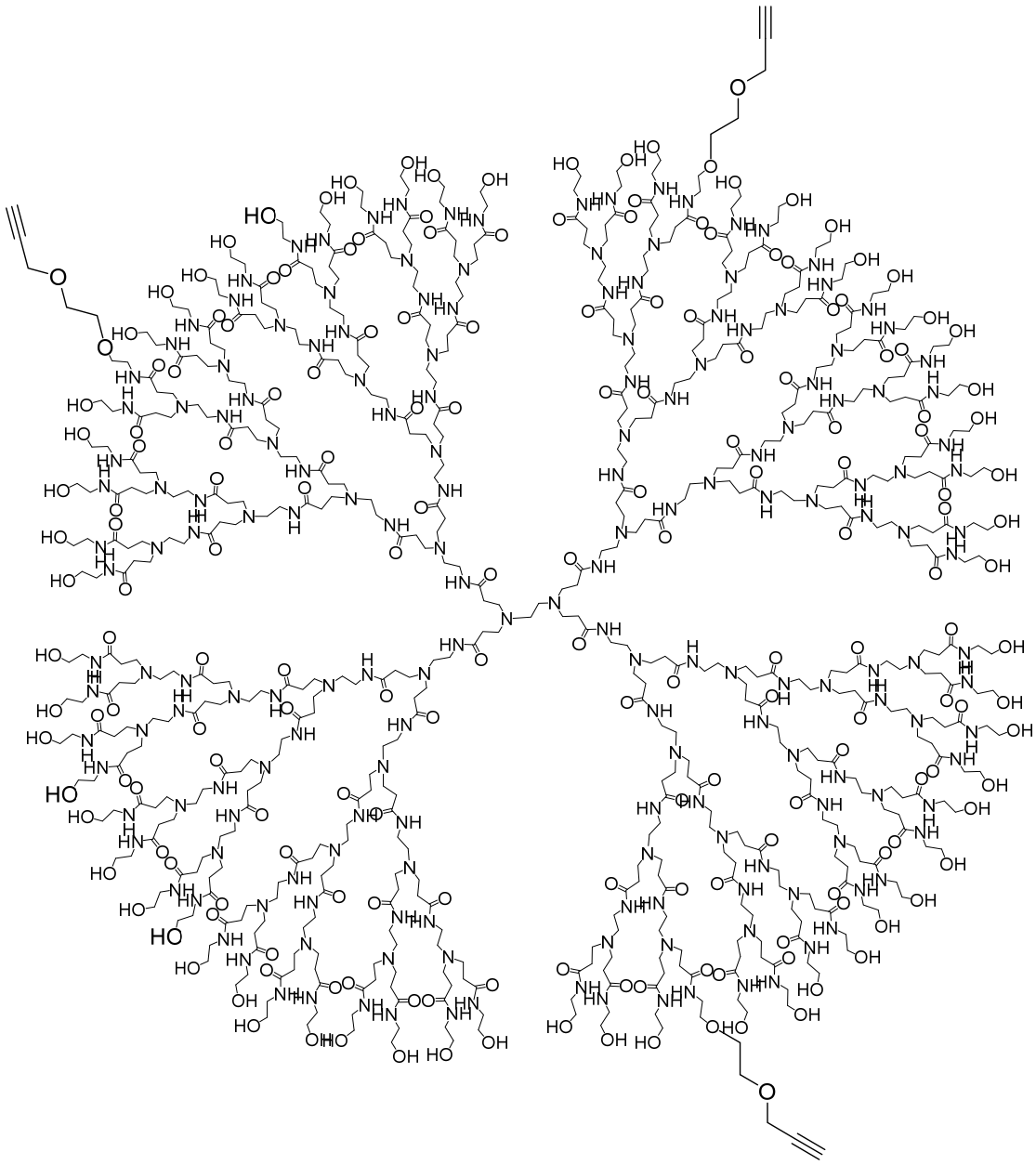
(i) the suitable conditions comprise a protic solvent and reacting at approximately 19 °C to approximately 23 °C; optionally wherein the protic solvent is an alcohol; further optionally wherein the protic solvent is methanol;

(ii) the suitable conditions comprise reacting at approximately 20 °C to approximately 22 °C; and/or

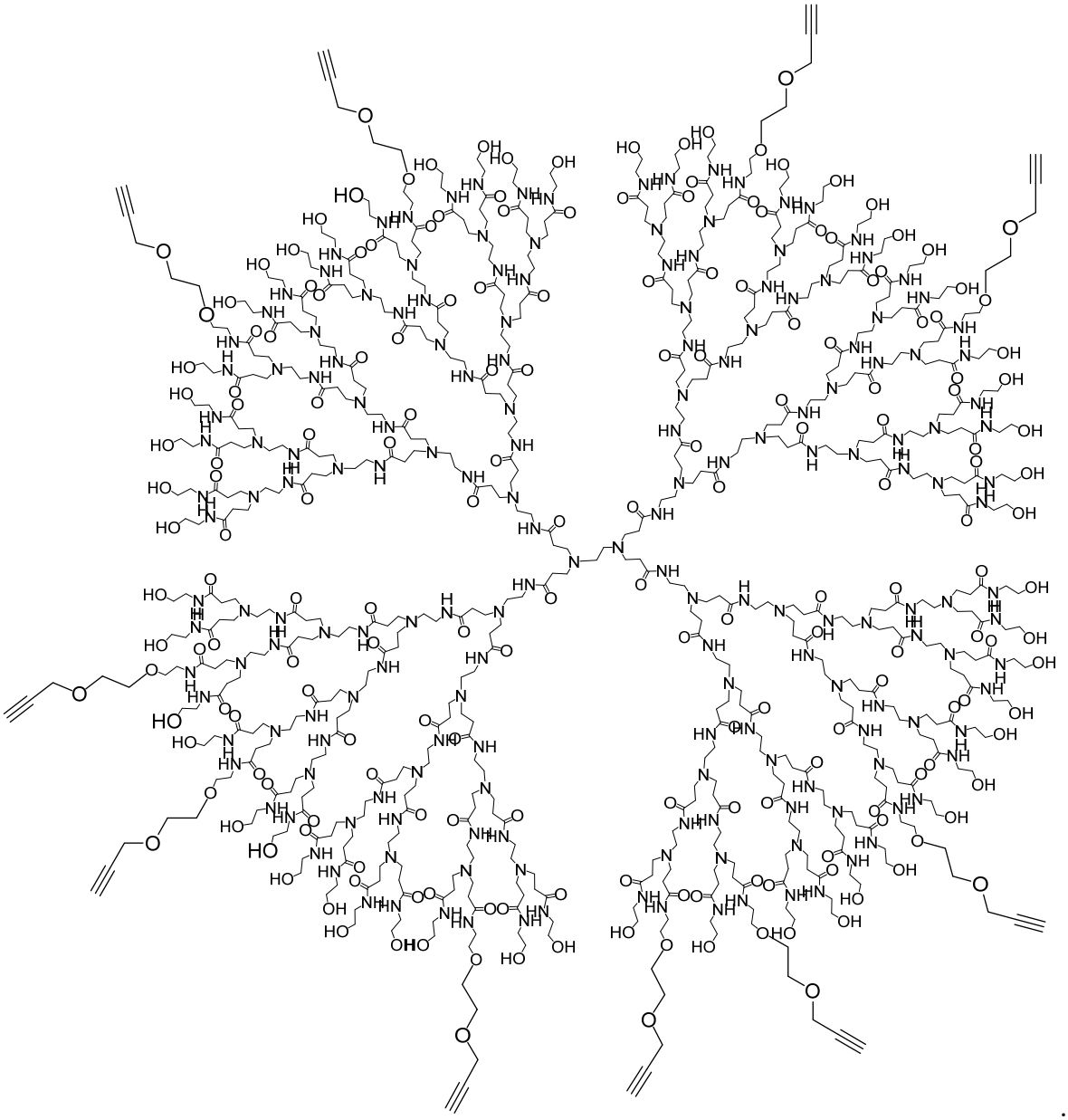
(iii) the suitable conditions comprise methanol and reacting at approximately 20 °C.

15. The method of any one of claims 3-14, wherein the functionalized dendrimer of

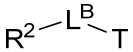
Formula (**I-A**) is of formula:



or



16. The method of any one of claims 3-15, further comprising reacting with a compound of Formula (**B**):



(**B**),

wherein:

R^2 is halogen, optionally substituted acyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted acetyl, optionally substituted carbocyclyl, optionally substituted heterocyclyl, optionally substituted aryl, optionally substituted heteroaryl, $-N_3$, $-CH(=N)(OH)R^{D1}$, -CN, $-NO_2$, $-OR^{D1}$, $-N(R^{D1a})_2$, $-SO_2OR^{D1}$, or $-SR^{D1}$,

wherein R^{D1} is independently hydrogen, optionally substituted acyl, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted carbocyclyl, optionally substituted heterocyclyl, optionally substituted aryl, optionally substituted heteroaryl, or an oxygen protecting group when attached to an oxygen atom, or a sulfur protecting group when attached to a sulfur atom;

wherein each occurrence of R^{D1a} is independently hydrogen, optionally substituted acyl, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted carbocyclyl, optionally substituted heterocyclyl, optionally substituted aryl, optionally substituted heteroaryl, or a nitrogen protecting group; or optionally two instances of R^{D1a} are taken together with their intervening atoms to form a substituted or unsubstituted heterocyclic or substituted or unsubstituted heteroaryl ring;

provided that R^{1A} and R^2 are reaction partners;

L^B is an alkylene linker, wherein one or more chain atoms of the hydrocarbon chain are independently replaced with amide, ester, hydroxamate, ether, carbonate, carbamate, hydrazone, thioether, thioester, disulfide, orthoester, urethane, or oxime moiety, or a cyclic moiety; and

T is a therapeutic agent.

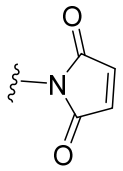
17. The method of any one of claims 3-16, wherein:

(i) R^{1A} and R^2 are bioconjugation reaction partners; and/or

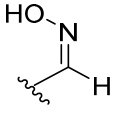
(ii) R^{1A} and R^2 are click reaction partners, optionally wherein R^{1A} and R^2 are click reaction partners from Table A.

18. The method of any one of claims 3-17, wherein:

(i) one of R^{1A} and R^2 is $-N_3$ and the other of R^{1A} and R^2 is dibenzocyclooctyne;

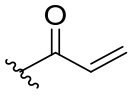
(ii) one of R^{1A} and R^2 is  and the other of R^{1A} and R^2 is -SH;

(iii) one of R^{1A} and R^2 is tetrazine and the other of R^{1A} and R^2 is trans–cyclooctene;

(iv) one of R^{1A} and R^2 is  and the other of R^{1A} and R^2 is ;

(v) one of R^{1A} and R^2 is -SH and the other of R^{1A} and R^2 is ;

(vi) one of R^{1A} and R^2 is -SH and the other of R^{1A} and R^2 is ; or

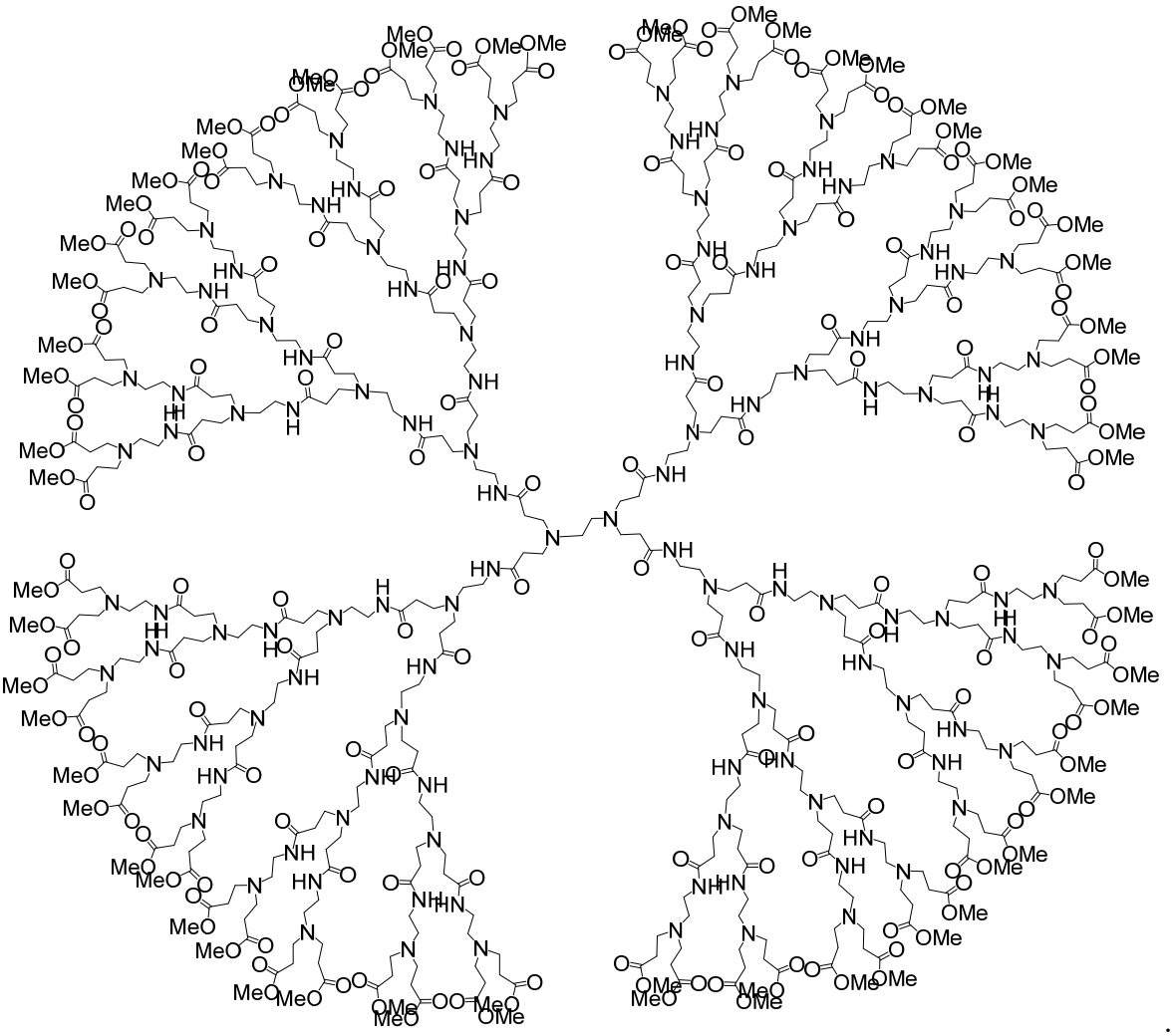
(vii) one of R^{1A} and R^2 -SH and the other of R^{1A} and R^2 is .

19. The method of any one of claims 16-18, wherein:

(i) at least one instance of T is a proteolysis targeting chimera (PROTAC) drug or a biologic therapeutic agent; optionally wherein the biologic therapeutic agent is a peptide, a nucleic acid, or an antibody, further optionally wherein the nucleic acid is an oligonucleotide, DNA, or RNA, yet further optionally wherein the RNA is siRNA; and/or

(ii) each instance of T is different.

20. A dendrimer of the formula:



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