CLAIM(S):

1. A polymer comprising a hydrolysable polymer backbone, the polymer backbone comprising:

(i) monomer units with a side chain comprising a hydrophobic group;

(ii) monomer units with a side chain comprising an oligoamine or polyamine; and optionally

(iii) monomer units with a side chain comprising an ionizable group, optionally with a pKa less than 7.

2. The polymer of claim 1, wherein the hydrophobic group comprises an alkyl group, alkenyl group, cycloalkyl group, or cycloalkenyl group.

3. The polymer of claim 1, wherien the hydrophobic group comprises a C_3-C_{12} linear or branched alkyl group, optionally a C_3-C_6 linear or branched alkyl group.

4. The polymer of any of claims 1-3, wherein the oligoamine or polyamine is a group of the formula:

$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2_2$;

$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2_2]_2$;

$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2_2][-(CH_2)_{q4}-NR^2-]_{r2}R^2\}$;

$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2_2]_2\}_2$;

$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-(CH_2)_{s1}-R^4-R^5$;

$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2-(CH_2)_{s2}-R^4-R^5]_2$;

$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2_2][-(CH_2)_{q4}-NR^2-]_{r2}(CH_2)_{s3}-R^4-R^5\}$;

$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2-(CH_2)_{s4}-R^4-R^5]_2\}_2$;

$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-CH_2-CHOH-R^5$;

$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2-CH_2-CHOH-R^5$;

$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2_2][-(CH_2)_{q4}-NR^2-]_{r2}-CH_2-CHOH-R^5$;

$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2-CH_2-CHOH-R^5]_2\}_2$;

$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-(CH_2)_{s1}-R^5$;

$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2-(CH_2)_{s2}-R^5]_2$;

$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2_2][-(CH_2)_{q4}-NR^2-]_{r2}(CH_2)_{s3}-R^5\}$;

$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2-(CH_2)_{s4}-R^5]_2\}_2$;

$-(CH_2)_{p1}-[N\{(CH_2)_{s1}-R^4-R^5\}-(CH_2)_{q1}-]_{r1}NR^2_2$;

~~$-(CH_2)_{p1}-[N\{(CH_2)_{s1}-R^5\}-(CH_2)_{q1}-]_{r1}NR^2_2$,~~

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-CH(CONH_2)-(CH_2)_{s1}-R^5$; or~~

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-CH(CONH_2)-(CH_2)_{s1}-R^4-R^5$,~~

~~wherein p1 to p4, q1 to q6, r1 and r2, and s1 to s4 are each independently an integer of 1 to 5; each instance of R^2 is independently hydrogen or a C_1-C_{12} alkyl group, alkenyl group, cycloalkyl group, or cycloalkenyl group, or R^2 is combined with a second R^2 so as to form a heterocyclic group; each instance of is independently -C(O)O-, -C(O)NH-, or -S(O)(O)-; and each instance of R^5 is independently an alkyl group, cycloalkyl group, alkenyl group, cycloalkenyl group, aryl group, heteroalkyl group, heterocyclic group, or combination thereof optionally comprising from 2 to 8 tertiary amines or a substituent comprising a tissue-specific or cell-specific targeting moiety.~~

~~5. The polymer of any one of claims 1-4, wherein the polyamine comprises~~

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2_2$;~~

~~$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2_2]_2$;~~

~~$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2_2][-(CH_2)_{q4}-NR^2-]_{r2}R^2\}$; or~~

~~$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2_2]_2\}_2$;~~

~~and each R^2 is independently hydrogen or a C_1-C_3 alkyl group;~~

~~optionally wherein the polyamine comprises~~

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2_2$.~~

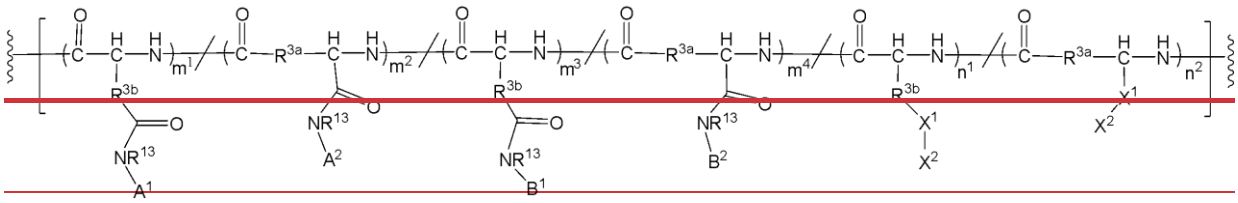
~~6. The polymer of any one of claims 1-5, wherein the hydrolysable polymer backbone comprises about 1 to about 80 mol% of the monomer units having a hydrophobic group, about 1 to about 80 mol% of the monomer units having an oligoamine or polyamine, and 0 to about 80 mol% of the monomer units having an ionizable group.~~

~~7. The polymer of any one of claims 1-6, wherein the hydrolysable polymer backbone comprises monomer units with a side chain comprising an ionizable group with a pKa less than 7.~~

~~8. The polymer of any one of claims 1-7, wherein the hydrolysable polymer backbone comprises a polyamide, poly-N-alkylamide, polyester, polycarbonate, polycarbamate, or a combination thereof.~~

9. The polymer of claim 8, wherein the hydrolysable polymer backbone comprises a polyamide.

10. The polymer of claim 1, comprising a structure of Formula 1:



wherein:

each of m^1, m^2, m^3, and m^4 is an integer from 0 to 1000, provided that the sum of $m^1 + m^2 + m^3 + m^4$ is greater than 5;

each of n^1 and n^2 is an integer from 0 to 1000, provided that the sum of $n^1 + n^2$ is greater than 2;

the symbol "/" indicates that the units separated thereby are linked randomly or in any order;

each instance of R^{3a} is independently a methylene or ethylene group;

each instance of R^{3b} is independently a methylene or ethylene group;

each X^1 independently is C(O)O, C(O)NR^{13}, C(O), S(O)(O), or a bond;

each instance of R^{13} is independently hydrogen, an aryl group, a heterocyclic group, a C_1-C_{12} alkyl group, C_2-C_{12} alkenyl group, C_3-C_{12} cycloalkyl group, or C_3-C_{12} cycloalkenyl group, any of which can be optionally substituted with one or more substituents;

each instance of X^2 is independently a C_1-C_{12} alkyl or heteroalkyl group, C_3-C_{12} cycloalkyl group, C_2-C_{12} alkenyl group, C_3-C_{12} cycloalkenyl group, aryl group, heterocyclic group, or combination thereof, any of which can be substituted with one or more substituents;

A^1 and A^2 are each independently a group of formula

$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2{}_2$;

$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2{}_2]_2$;

$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2{}_2][-(CH_2)_{q4}-NR^2-]_{r2}R^2\}$; or

$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2{}_2]_2\}_2$;

B^1 and B^2 are each independently

$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-(CH_2)_{s1}-R^4-R^5$;

$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2-(CH_2)_{s2}-R^4-R^5]_2$;

~~$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2{}_2][-(CH_2)_{q4}-NR^2-]_{r2}(CH_2)_{s3}-R^4-R^5\};$~~

~~$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2-(CH_2)_{s4}-R^4-R^5]_2\}_2;$~~

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-CH_2-CHOH-R^5;$~~

~~$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2-CH_2-CHOH-R^5;$~~

~~$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2{}_2][-(CH_2)_{q4}-NR^2-]_{r2}-CH_2-CHOH-R^5;$~~

~~$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2-CH_2-CHOH-R^5]_2\}_2;$~~

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-(CH_2)_{s1}-R^5;$~~

~~$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2-(CH_2)_{s2}-R^5]_2;$~~

~~$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2{}_2][-(CH_2)_{q4}-NR^2-]_{r2}(CH_2)_{s3}-R^5\};$~~

~~$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2-(CH_2)_{s4}-R^5]_2\}_2;$~~

~~$-(CH_2)_{p1}-[N\{(CH_2)_{s1}-R^4-R^5\}-(CH_2)_{q1}-]_{r1}NR^2{}_2;$~~

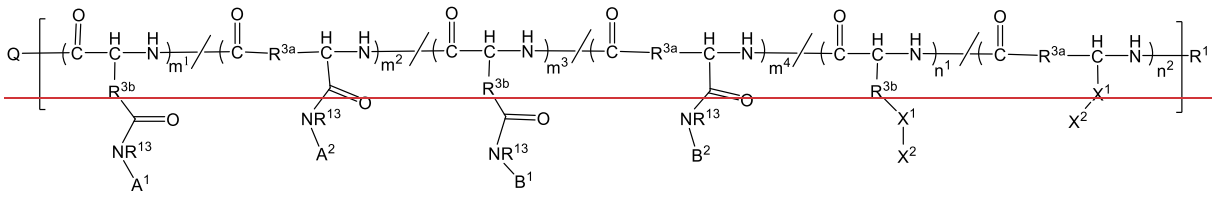
~~$-(CH_2)_{p1}-[N\{(CH_2)_{s1}-R^5\}-(CH_2)_{q1}-]_{r1}NR^2{}_2,$~~

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-CH(CONH_2)-(CH_2)_{s1}-R^5;$~~ or

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-CH(CONH_2)-(CH_2)_{s1}-R^4-R^5,$~~

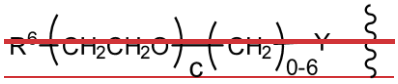
~~wherein p1 to p4, q1 to q6, r1 and r2, and s1 to s4 are each independently an integer of 1 to 5; each instance of R^2 is independently hydrogen or a C_1-C_{12} alkyl group, C_2-C_{12} alkenyl group, C_3-C_{12}cycloalkyl group, or C_3-C_{12}cycloalkenyl group, or R^2 is combined with a second R^2 so as to form a heterocyclic group; each instance of R^4 is independently -C(O)O-, -C(O)NH-, -O-C(O)O-, or -S(O)(O)-; and each instance of R^5 is independently an alkyl group, cycloalkyl group, alkenyl group, cycloalkenyl group, aryl group, heteroalkyl group, heterocyclic group, or combination thereof optionally comprising from 2 to 8 tertiary amines or a substituent comprising a tissue-specific or cell-specific targeting moiety.~~

~~11. The polymer of claim 10, having the structure of Formula 1A:~~



~~wherein~~

~~Q is of formula:~~



c is an integer from 0 to 50;

Y is optionally present and is a cleavable linker;

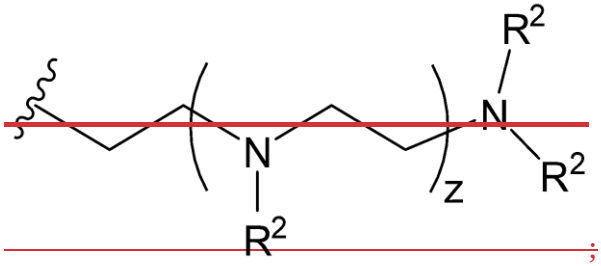
R^1 is hydrogen, an aryl group, a heterocyclic group, a C_1-C_{12} alkyl group, alkenyl group, cycloalkyl group, or cycloalkenyl group, or a C_1-C_{12} linear or branched alkyl group optionally substituted with one or more substituents;

R^6 is hydrogen, an amino group, an aryl group, a heterocyclic group, a C_1-C_{12} alkyl group, a C_1-C_{12} heteroalkyl group, alkenyl group, cycloalkyl group, or cycloalkenyl group, a C_1-C_{12} linear or branched alkyl group optionally substituted with one or more amines; or a tissue-specific or cell-specific targeting moiety;

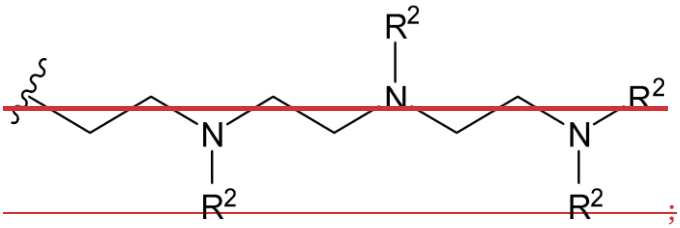
and m^1, m^2, m^3, m^4, n^1, n^2, R^{3a}, R^{3b}, R^{13}, X^1, X^2, A^1, A^2, B^1, and B^2 are as defined in 10.

12. The polymer of claim 10 or 11, wherein each of B^1 and B^2 is a group of formula $-(CH_2)_2-NH-(CH_2)_2-NH-(CH_2)_2-R^4-R^5$.

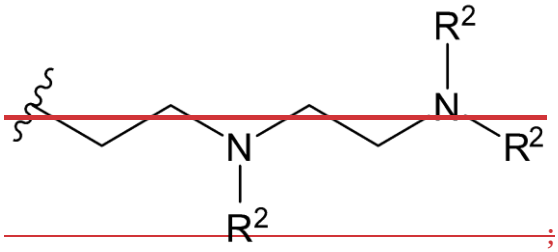
13. The polymer of any of claims 10-12, wherein each R^5 is independently:



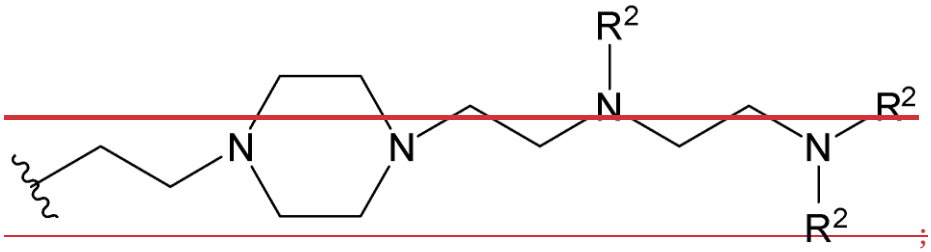
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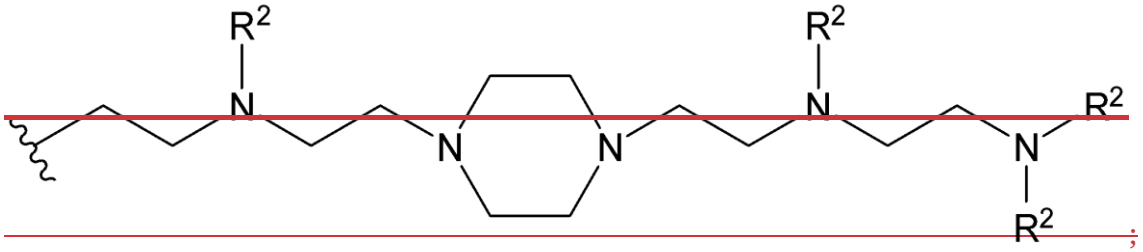
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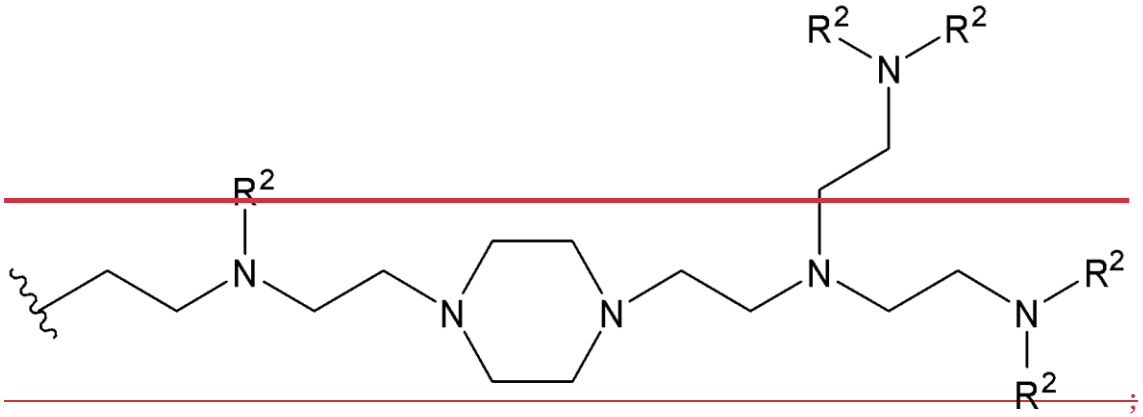
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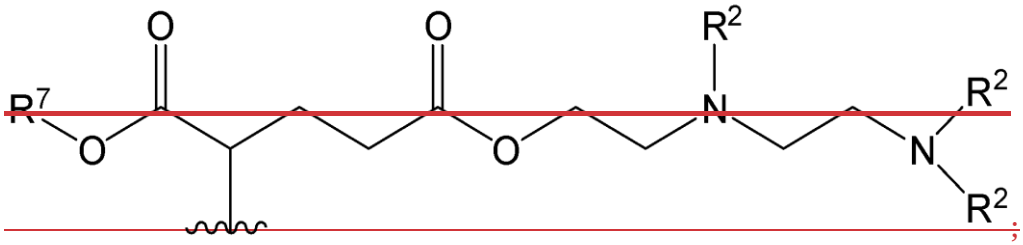
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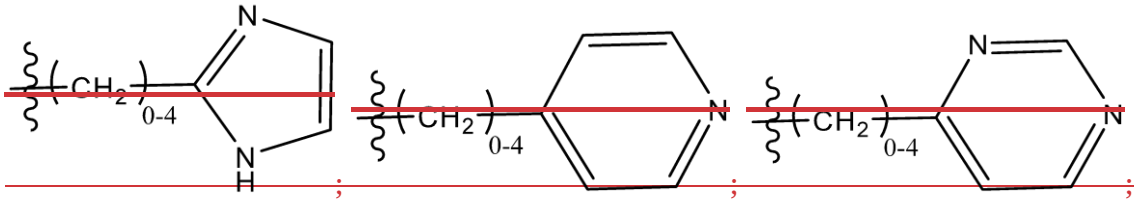
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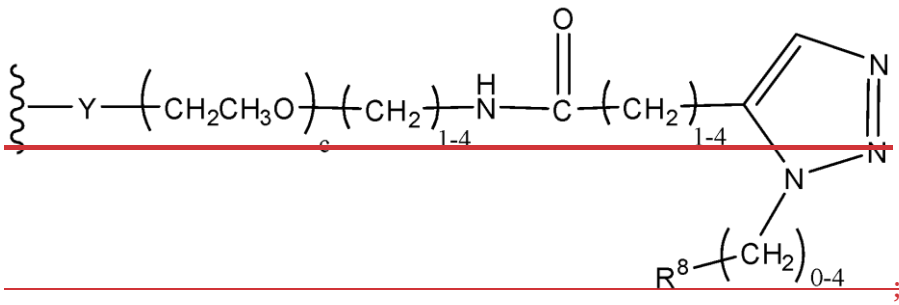
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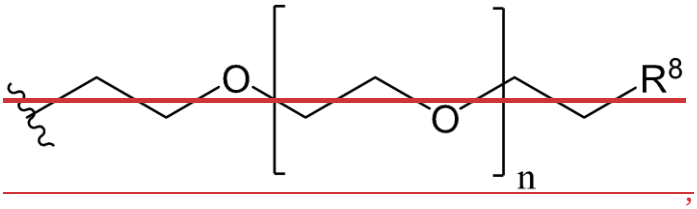
;



;



; and



,

wherein

each instance of R^2 is independently hydrogen or a C_1-C_{12} alkyl group, alkenyl group, cycloalkyl group, or cycloalkenyl group, or R^2 is combined with a second R^2 so as to form a heterocyclic group;

R^7 is a C_1-C_{50} alkyl group, alkenyl group, cycloalkyl group, or cycloalkenyl group optionally substituted with one or more amines;

z is an integer from 1 to 5;

c is an integer from 0 to 50;

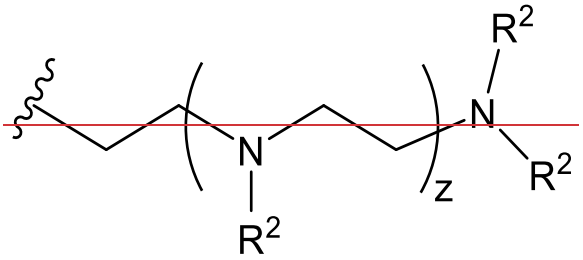
Y is optionally present and is a cleavable linker;

n is an integer from 0 to 50; and

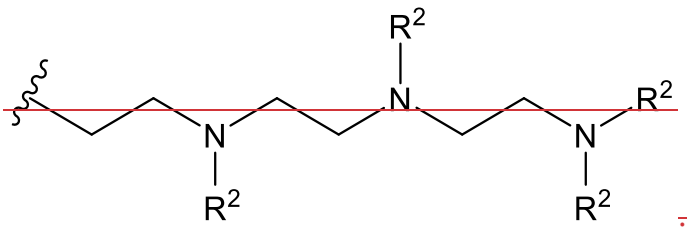
R^8 is a tissue-specific or cell-specific targeting moiety.

14. The polymer of any of claims 10-13, wherein R^4 is -C(O)-O-.

15. The polymer of any of claims 10-14, wherein R^5 is



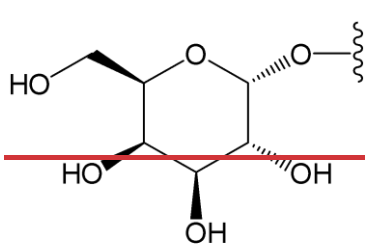
or



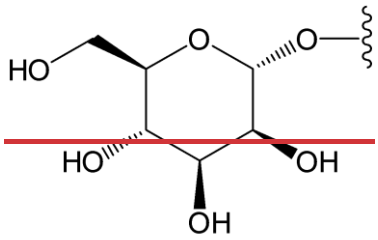
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16. A polymer of any of claims 10-15, wherein the ratio of $(m^1+m^2+m^3+m^4)/(n^1+n^2)$ is about 25 or less, and, optionally, about 1 or more.

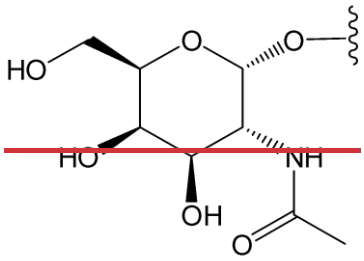
~~17. The polymer of any one of claims 10-16, wherein the tissue-specific or cell-specific targeting moiety is:~~



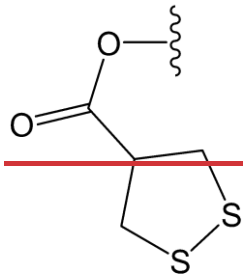
alpha-d-galactose ;



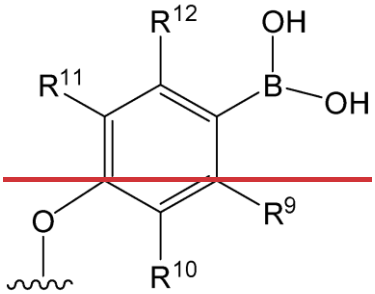
alpha-d-mannose ;



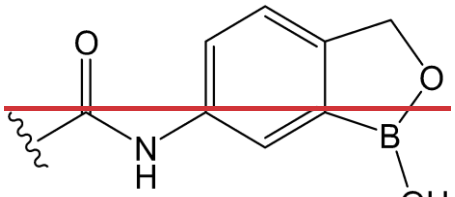
N-acetylgalactosamine ;



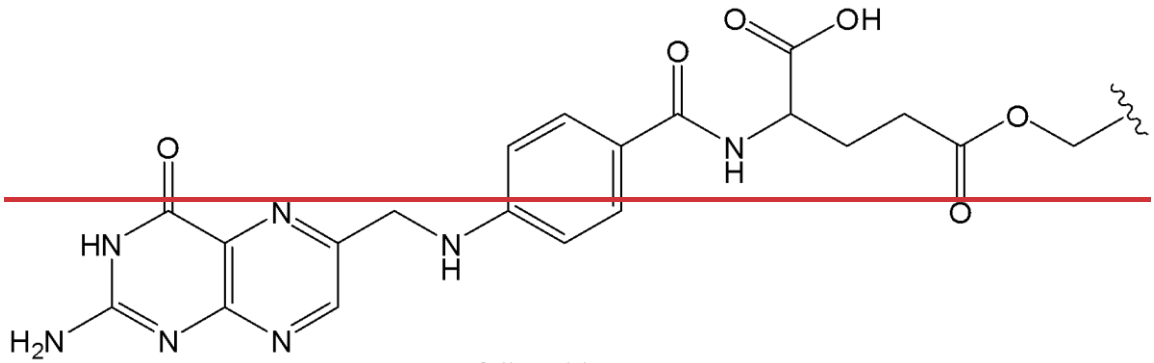
Asparagusic acid ;



Phenylboronic acid ;



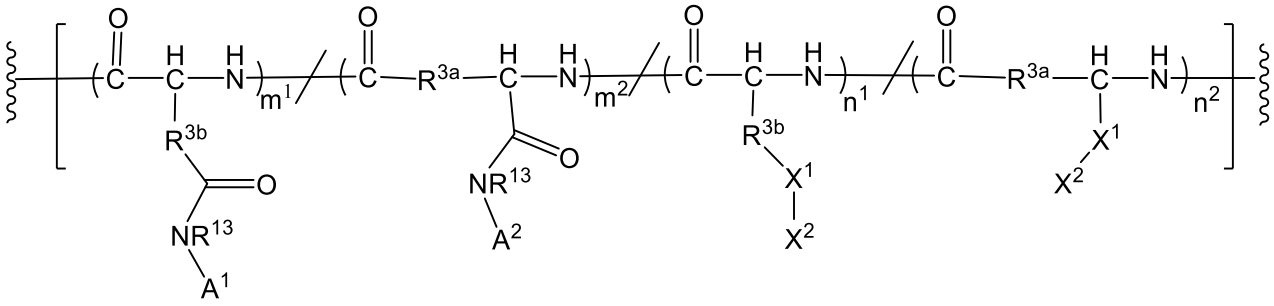
OH; ~~or~~



folic acid ,

~~wherein each of R^9, R^{10}, R^{11}, and R^{12} is independently hydrogen, halogen, C_1-C_4 alkyl, or C_1-C_4 alkoxy, optionally substituted with one or more amino groups.~~

~~18~~1. ~~The polymer of claim 10~~A polymer having the structure of Formula 4:



Formula 4

wherein:

each of m^1 and m^2 is an integer from 0 to 1000, provided that the sum of $m^1 + m^2$ is greater than 5;

each of n^1 and n^2 is an integer from 0 to 1000, provided that the sum of $n^1 + n^2$ is greater than 2;

the symbol "/" indicates that the units separated thereby are linked randomly or in any order;

each instance of R^{3a} is independently a methylene or ethylene group;

each instance of R^{3b} is independently a methylene or ethylene group;

each X^1 independently is —C(O)O—, —C(O)NR^{13}—, —C(O)—, —S(O)(O)—, or a bond;

each instance of R^{13} is independently hydrogen, an aryl group, a heterocyclic group, a C_1-C_{12} alkyl group, C_2-C_{12} alkenyl group, C_3-C_{12} cycloalkyl group, or C_3-C_{12} cycloalkenyl group, any of which can be optionally substituted with one or more substituents;

each instance of X^2 is independently a C_1-C_{12} alkyl or heteroalkyl group, C_3-C_{12} cycloalkyl group, C_2-C_{12} alkenyl group, C_3-C_{12} cycloalkenyl group, aryl group, heterocyclic group, or combination thereof, any of which can be substituted with one or more substituents;

A^1 and A^2 are each independently a group of formula

—$(CH_2)_{p1}$—[NR^2—$(CH_2)_{q1}$—]$_{r1}$NR$^2_2$;

—$(CH_2)_{p2}$—N[—$(CH_2)_{q2}$—NR$^2_2$]$_2$;

—$(CH_2)_{p3}$—N{[—$(CH_2)_{q3}$—NR$^2_2$][—$(CH_2)_{q4}$—NR^2—]$_{r2}$R^2}; or

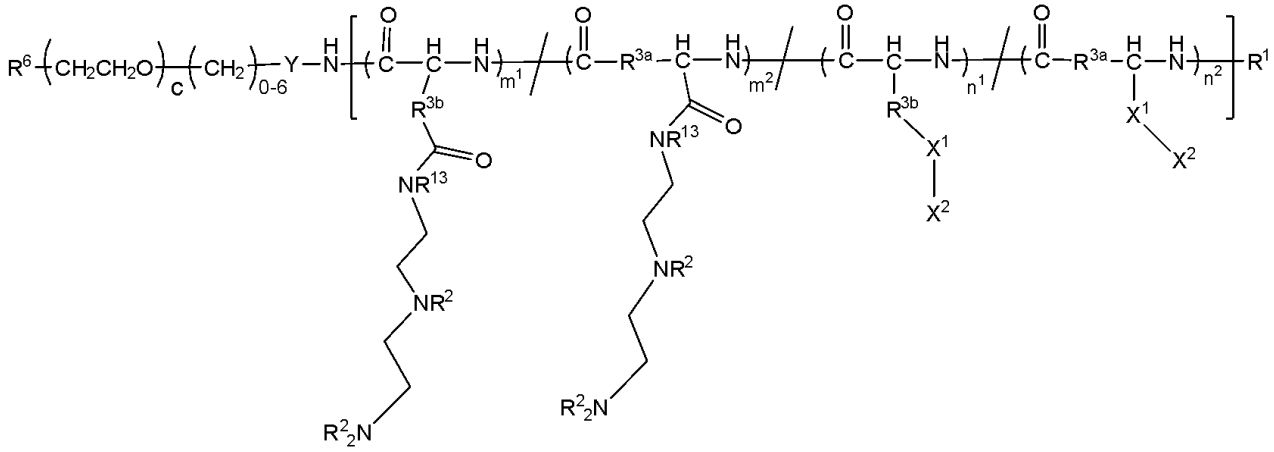
—$(CH_2)_{p4}$—N{—$(CH_2)_{q5}$—N[—$(CH_2)_{q6}$—NR$^2_2$]$_2$}$_2$,

wherein p1 to p4, q1 to q6, and r1 and r2, are each independently an integer of 1 to 5; and each instance of R^2 is independently hydrogen or a C_1-C_{12} alkyl group, C_2-C_{12} alkenyl group, C_3-C_{12}cycloalkyl group, or C_3-C_{12}cycloalkenyl group, or R^2 is combined with a second R^2 so

as to form a heterocyclic group,

and wherein each nitrogen in group A^1 and A^2 containing R^2 substituents is a tertiary amine, with the exception that the terminal amine can be a primary, secondary, or tertiary amine~~m^1, m^2, n^1, n^2, R^{3a}, R^{3b}, R^{13}, X^1, X^2, A^1, and A^2 are as defined in claim 10~~.

~~19~~2. The polymer of claim ~~10~~1, having the structure of Formula 1B:



wherein

c is an integer from 0 to 50;

Y is optionally present and is a cleavable linker;

R^1 is hydrogen, an aryl group, a heterocyclic group, a C_1-C_{12} alkyl group, C_2-C_{12} alkenyl group, C_3-C_{12} cycloalkyl group, or C_3-C_{12} cycloalkenyl group, any of which are optionally substituted with one or more substituents;

each instance of R^2 is independently hydrogen or a C_1-C_{12} alkyl group, C_2-C_{12} alkenyl group, C_3-C_{12} cycloalkyl group, or C_3-C_{12} cycloalkenyl group; and

R^6 is hydrogen, an amino group, an aryl group, a heterocyclic group, a C_1-C_{12} alkyl group, a C_1-C_{12} heteroalkyl group, C_2-C_{12} alkenyl group, C_3-C_{12} cycloalkyl group, or C_3-C_{12} cycloalkenyl group, optionally substituted with one or more amines; or a tissue-specific or cell-specific targeting moiety;

and m^1, m^2, n^1, n^2, R^{3a}, R^{3b}, R^{13}, X^1, and X^2~~, A^1, and A^2~~ are as defined in claim ~~10~~1.

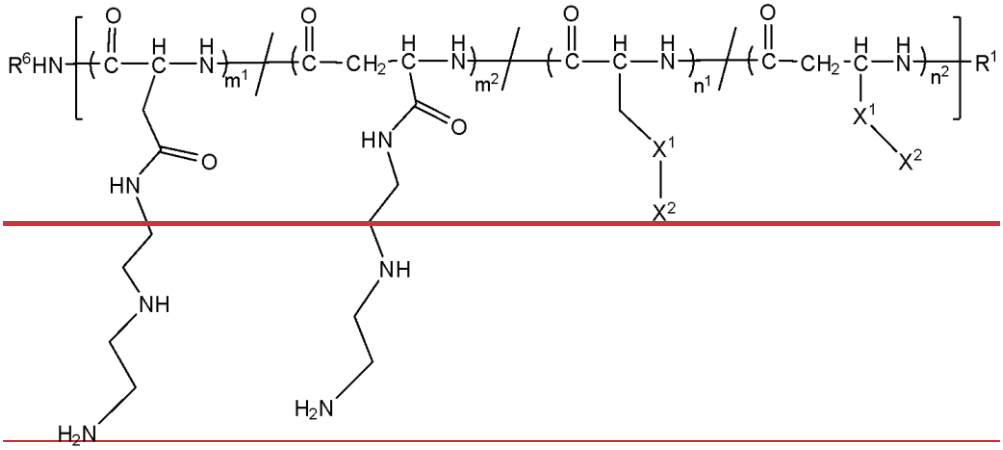
3. The polymer of claim 1 or 2, wherein each instance of R^2 is a C_1-C_3 alkyl.

4. The polymer of any of claims 1-3, wherein each instance of X^2 is independently a C_1-C_{12} alkyl or heteroalkyl group, C_3-C_{12} cycloalkyl group, C_2-C_{12} alkenyl group, C_3-C_{12} cycloalkenyl group, or combination thereof.

5. The polymer of any of claims 1-4, wherein $n^1 + n^2$ is 10-50.

6. The polymer of any of claims 1-5, wherein $m^1 + m^2$ is 20-50.

~~20. The polymer of claim 10, having the structure of Formula 1C:~~



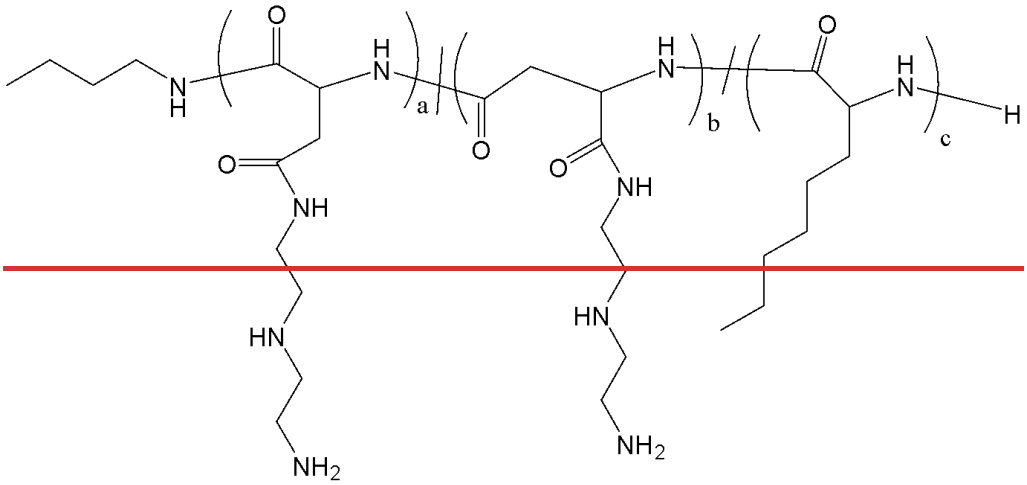
~~wherein~~

~~R^1 is hydrogen, an aryl group, a heterocyclic group, a C_1-C_{12} alkyl group, C_2-C_{12} alkenyl group, C_3-C_{12} cycloalkyl group, or C_3-C_{12} cycloalkenyl group, any of which are optionally substituted with one or more substituents; and~~

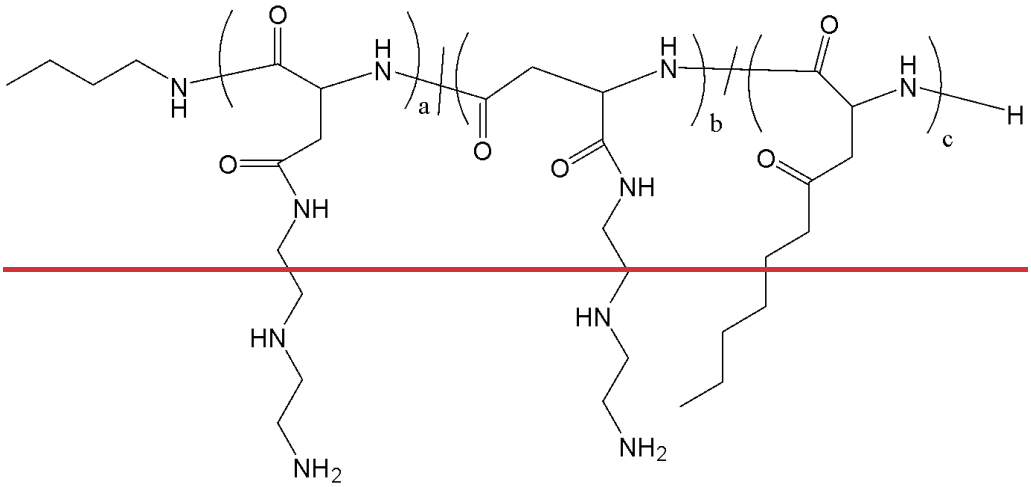
~~R^6 is hydrogen, an amino group, an aryl group, a heterocyclic group, a C_1-C_{12} alkyl group, a C_1-C_{12} heteroalkyl group, C_2-C_{12} alkenyl group, C_3-C_{12} cycloalkyl group, or C_3-C_{12} cycloalkenyl group, any of which are optionally substituted with one or more amines; or a tissue-specific or cell-specific targeting moiety;~~

~~wherein m^1, m^2, n^1, n^2, R^{3a}, R^{3b}, R^{13}, X^1, X^2, A^1, and A^2 are as defined in 8.~~

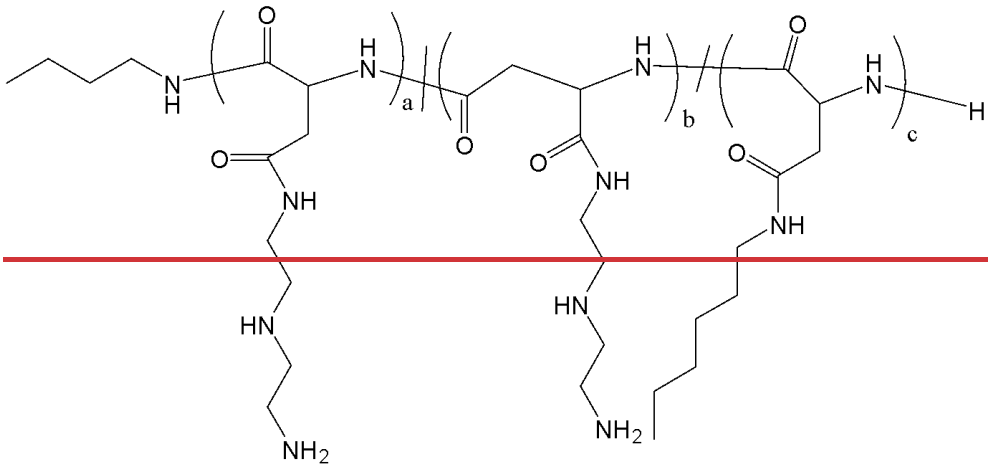
~~21~~7. The polymer of claim 1~~10~~, having the formula:



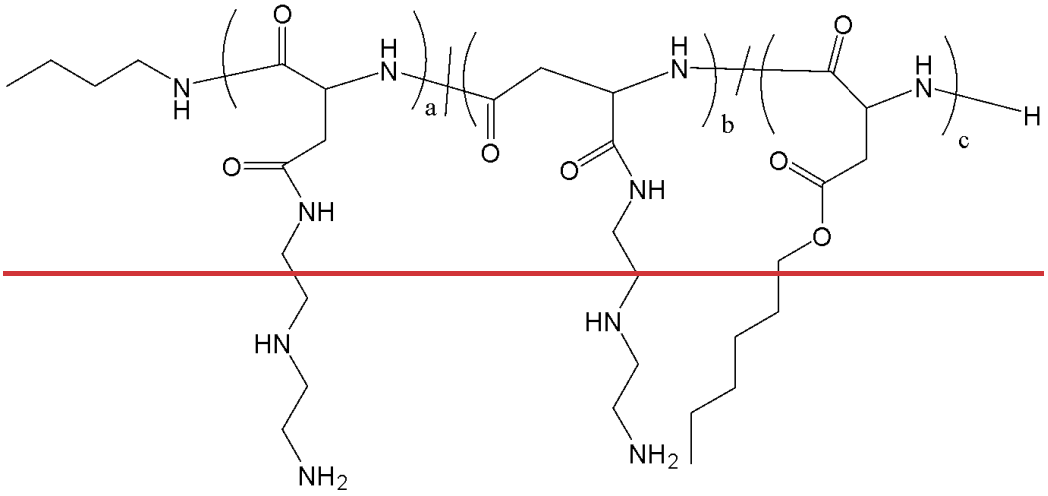
Polymer 1



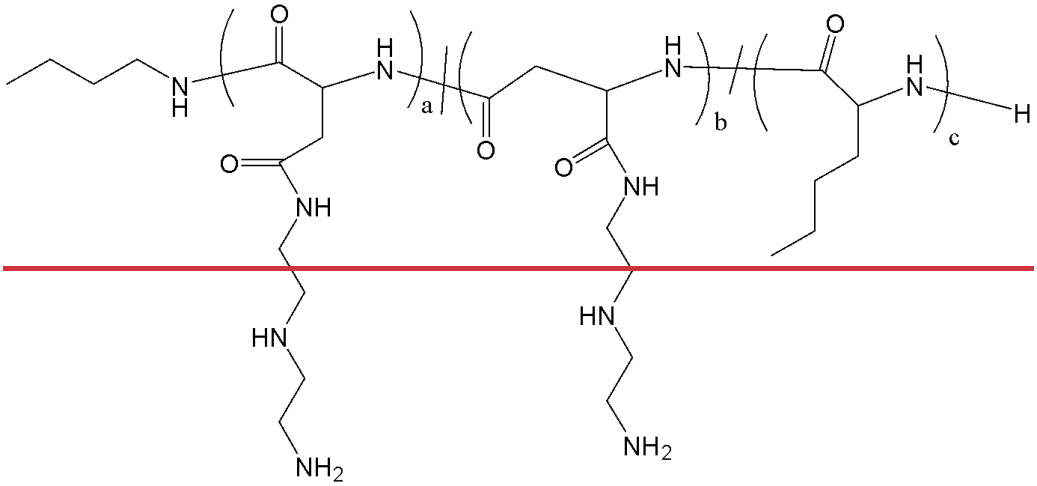
Polymer 2



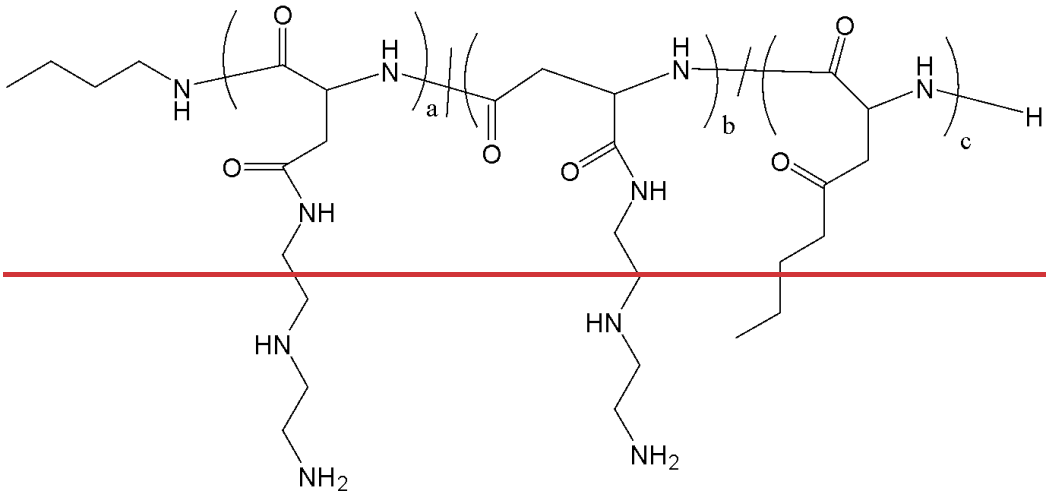
Polymer 3



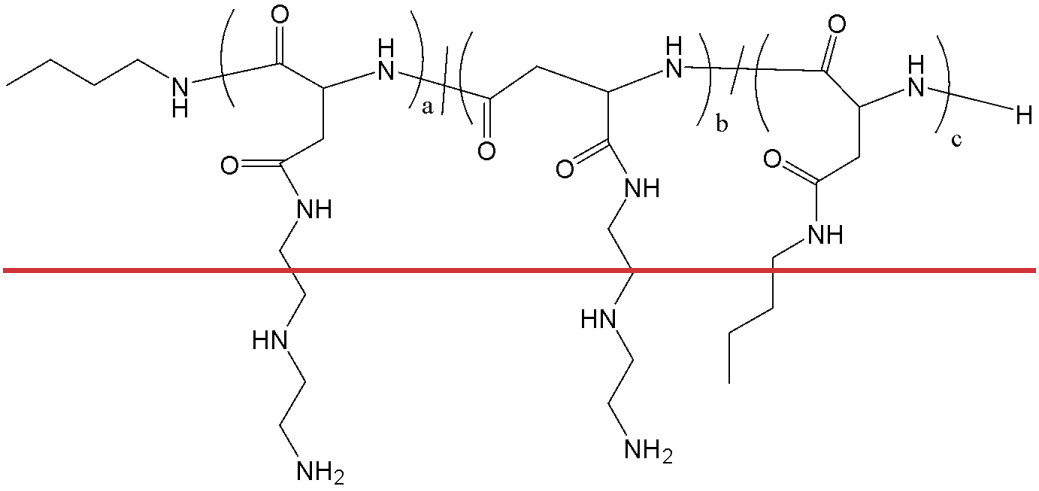
Polymer 4



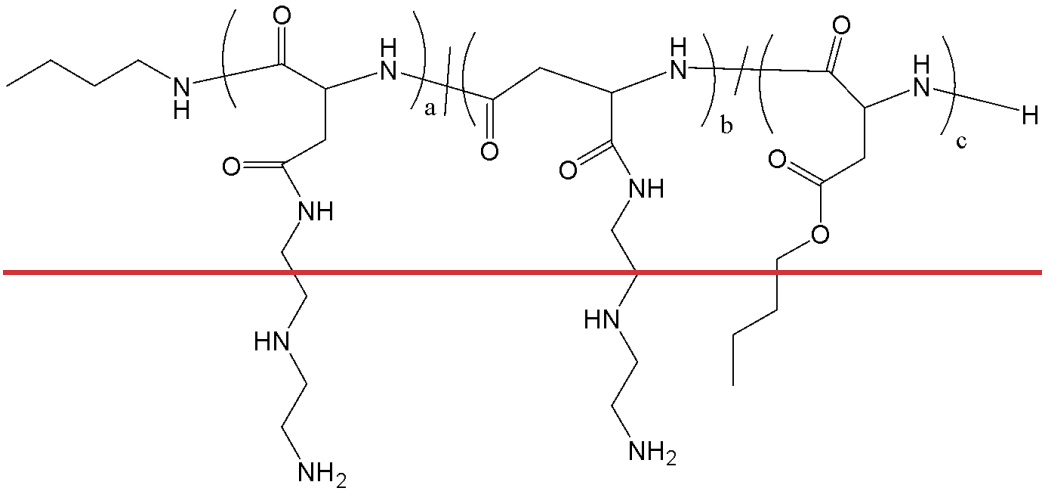
Polymer 5



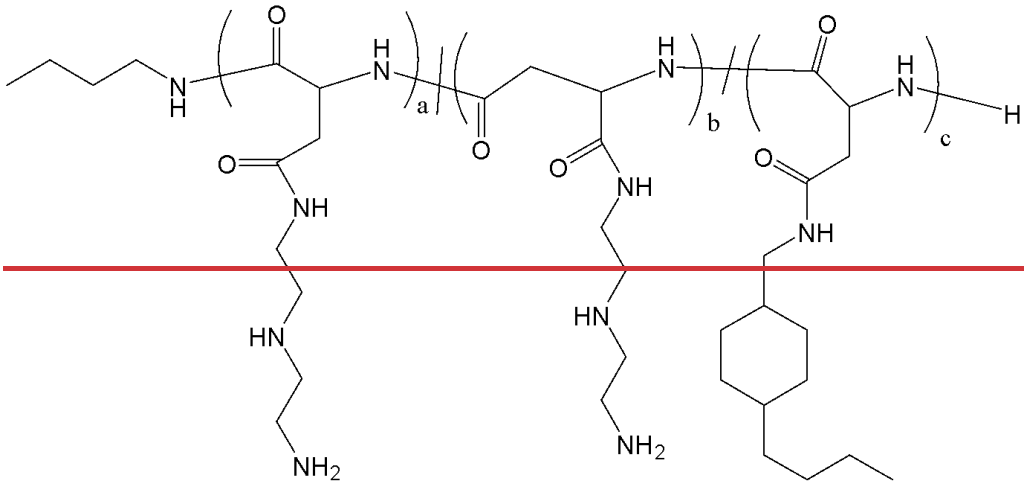
Polymer 6



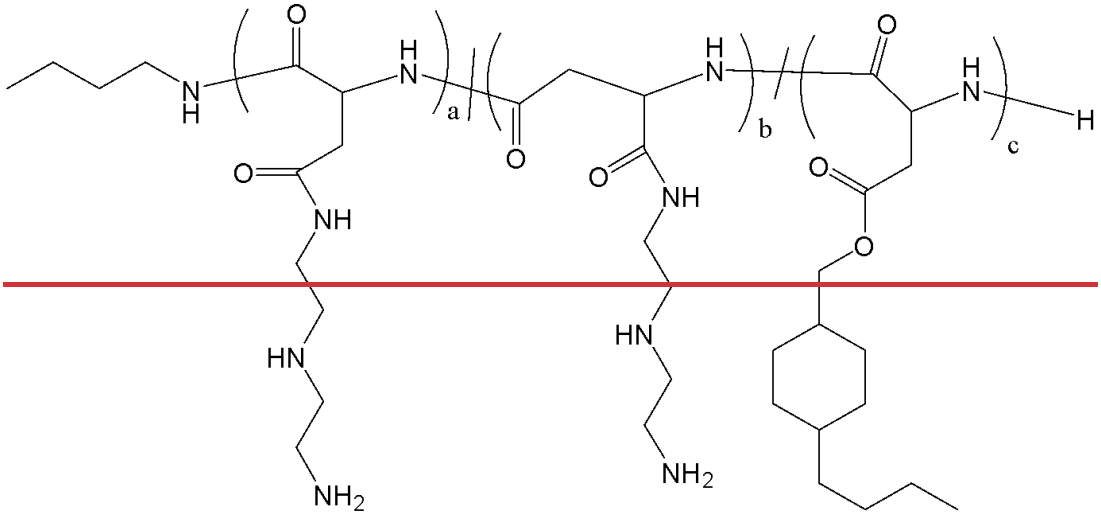
Polymer 7



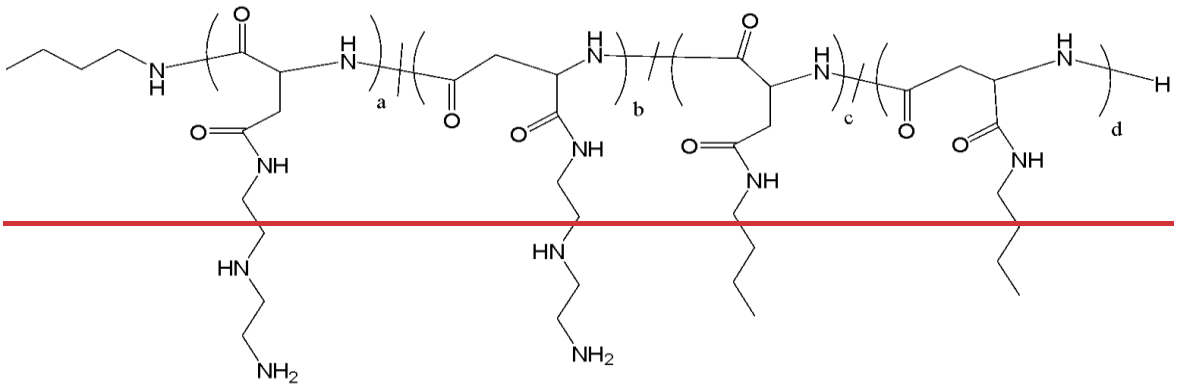
Polymer 8



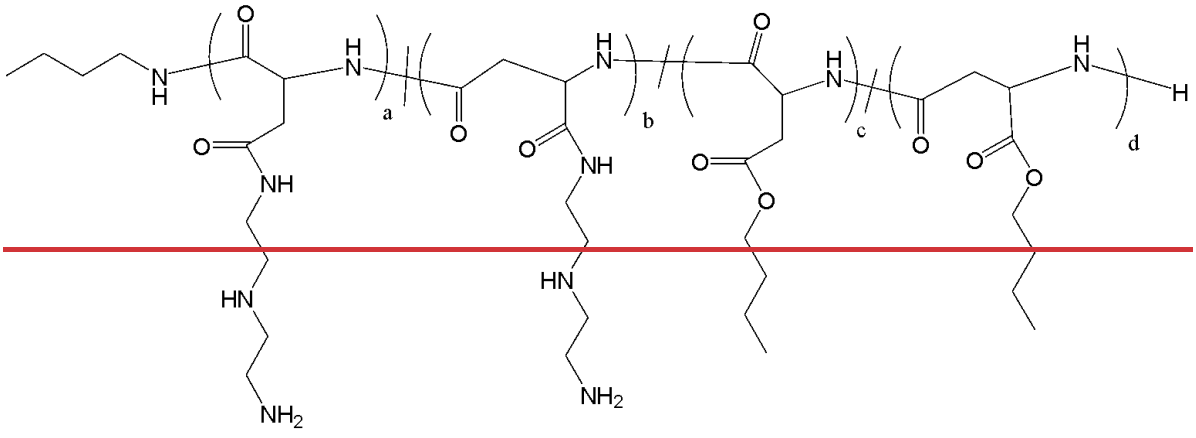
Polymer 9



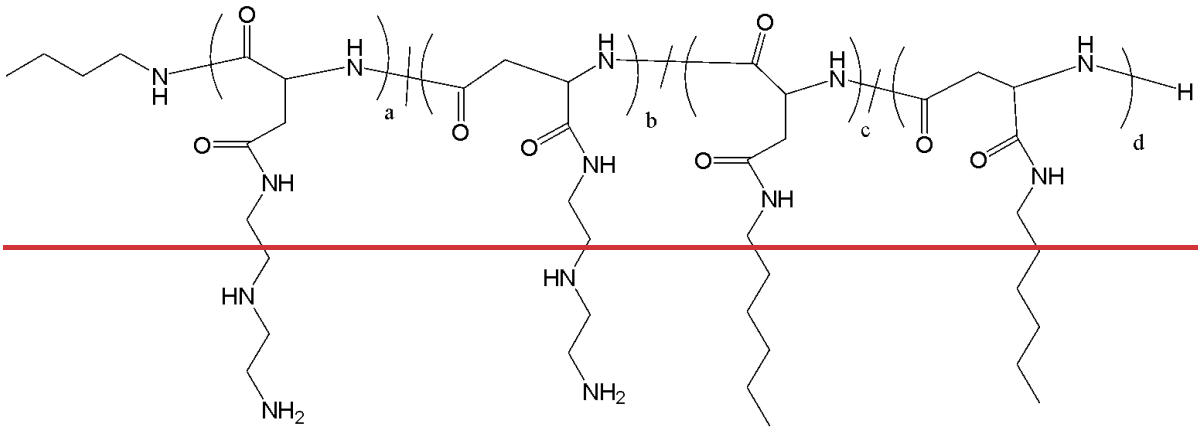
Polymer 10



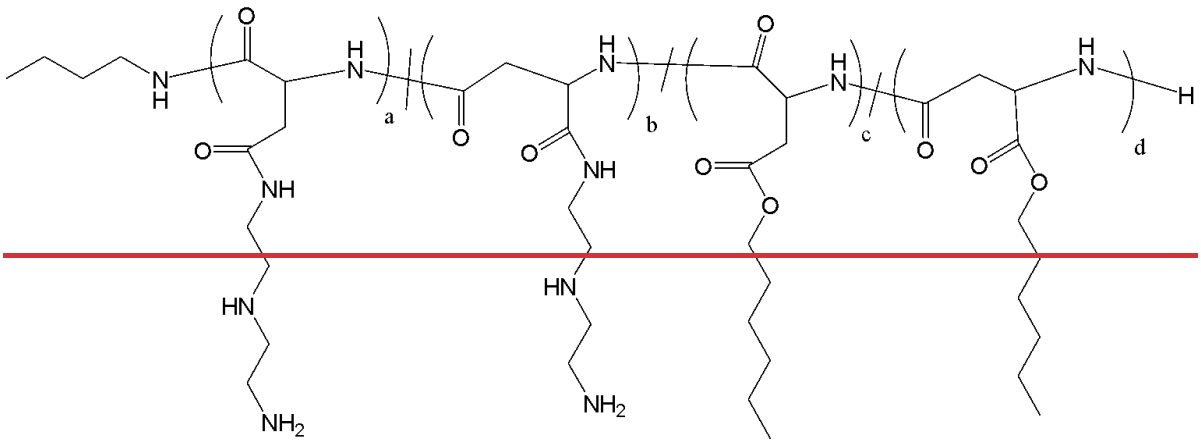
Polymer 11



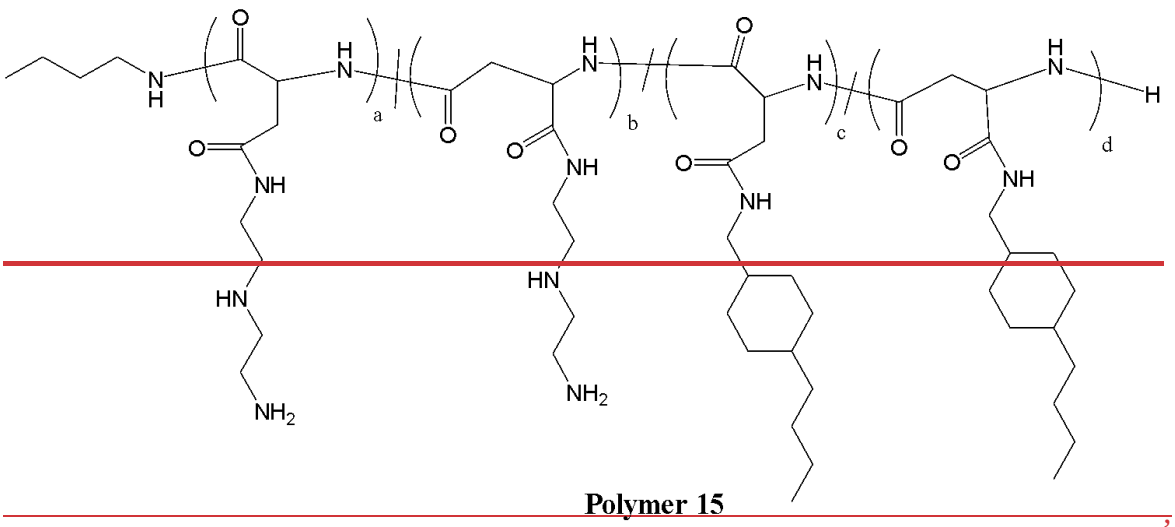
Polymer 12



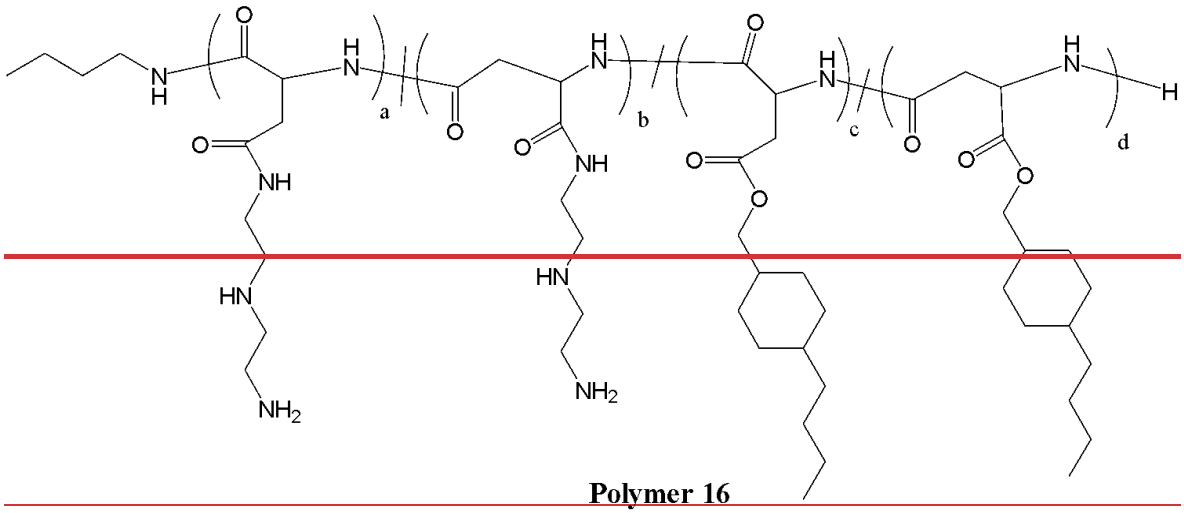
Polymer 13



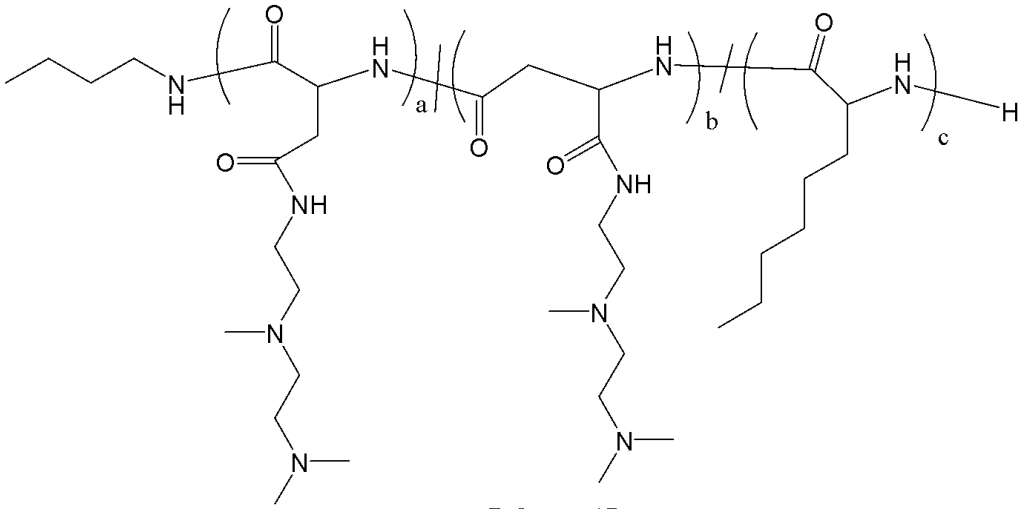
Polymer 14



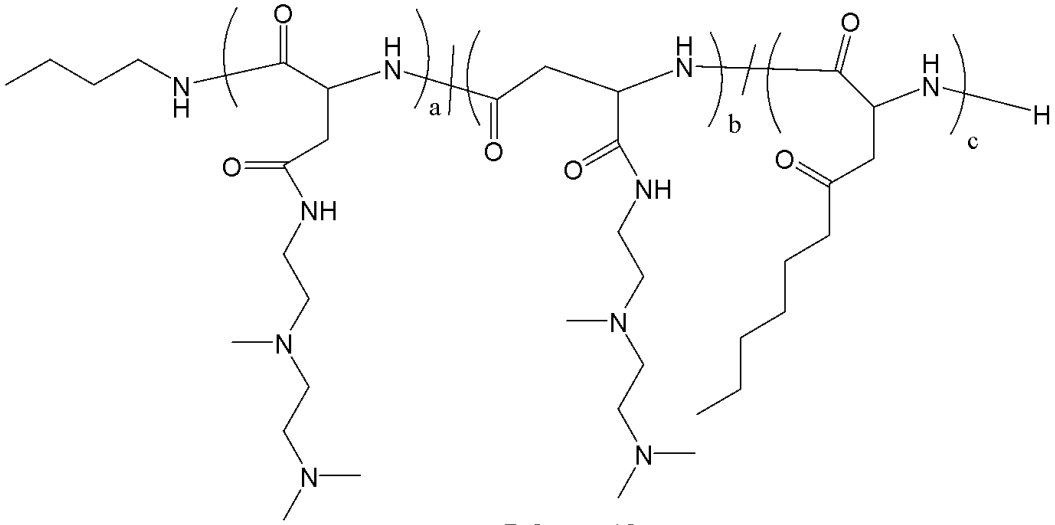
Polymer 15



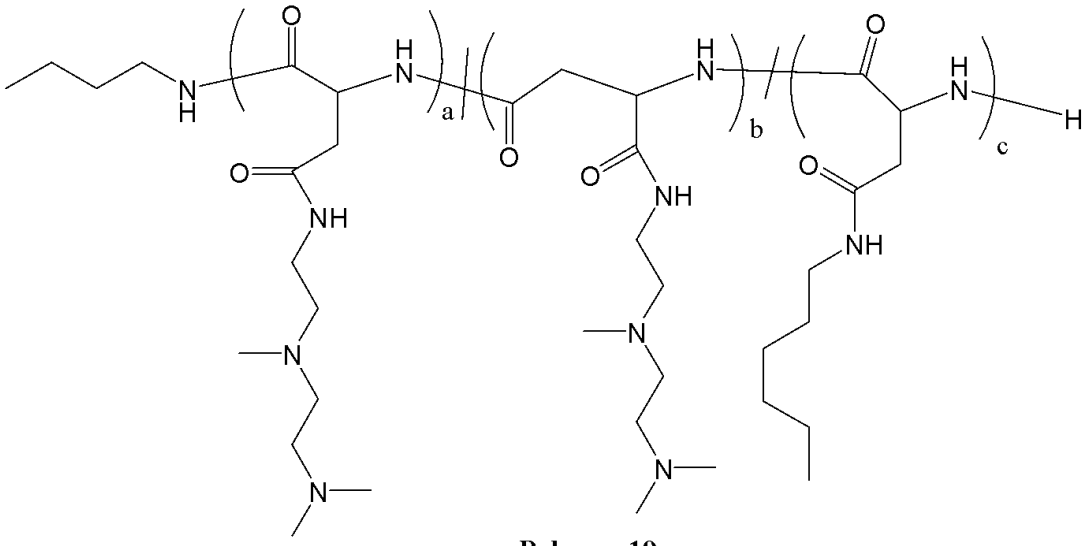
Polymer 16



Polymer 17

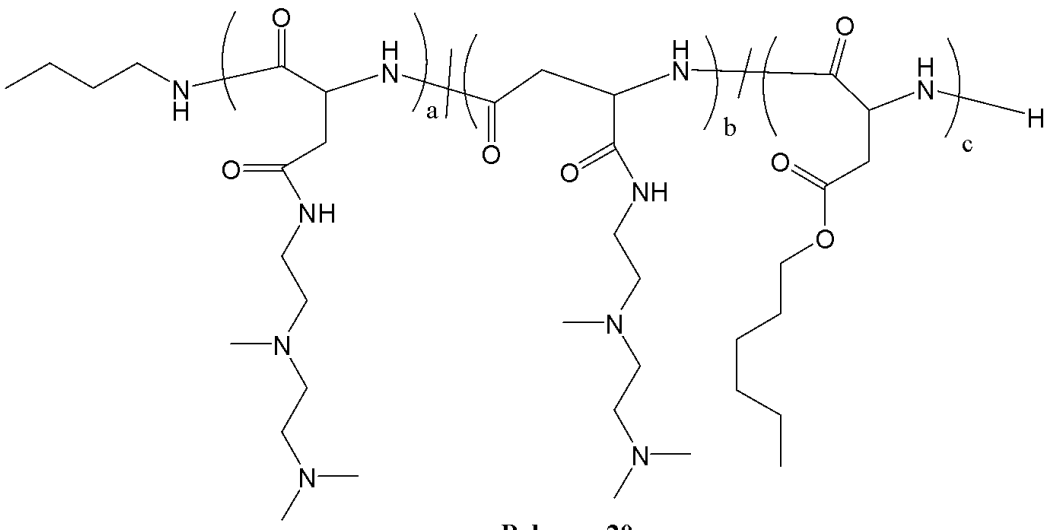


Polymer 18



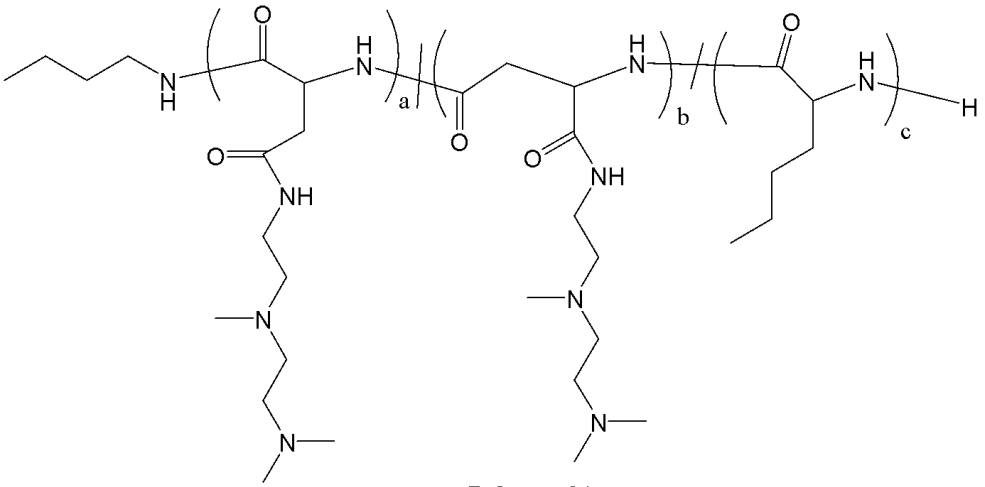
Polymer 19

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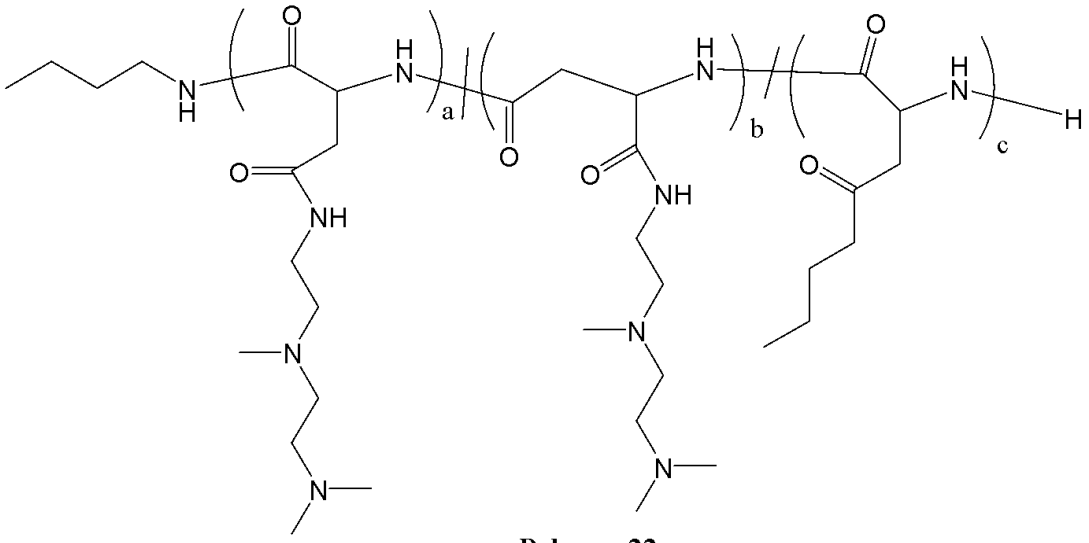
Polymer 20

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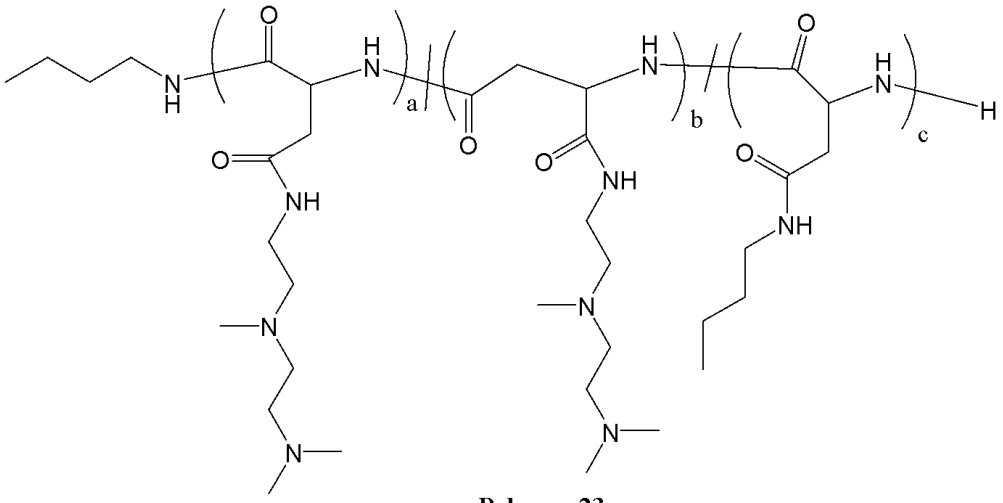
Polymer 21

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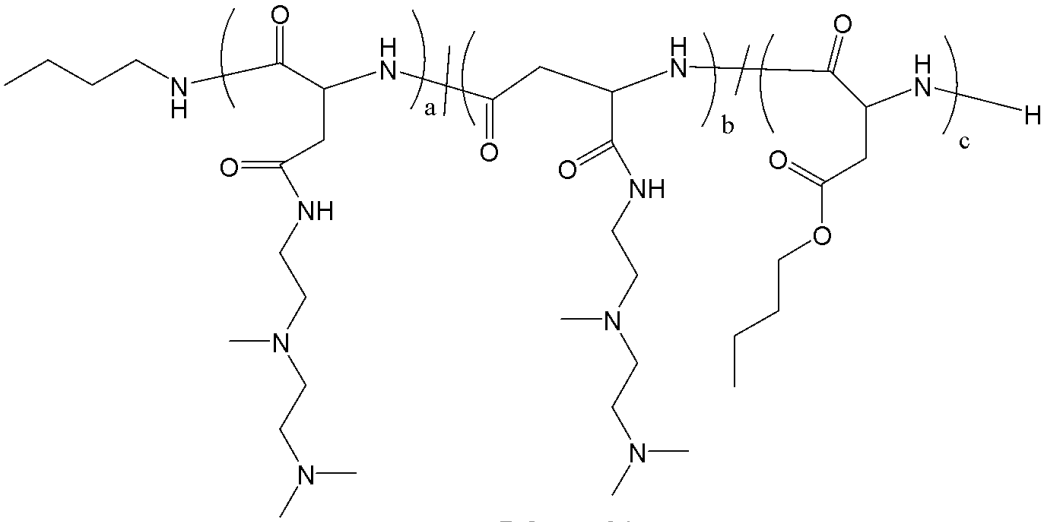
Polymer 22

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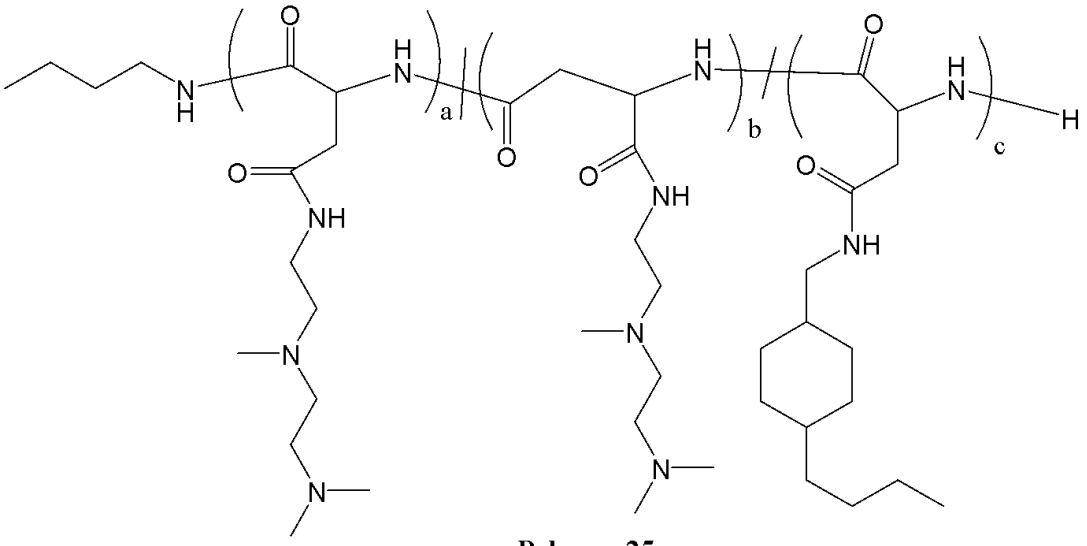
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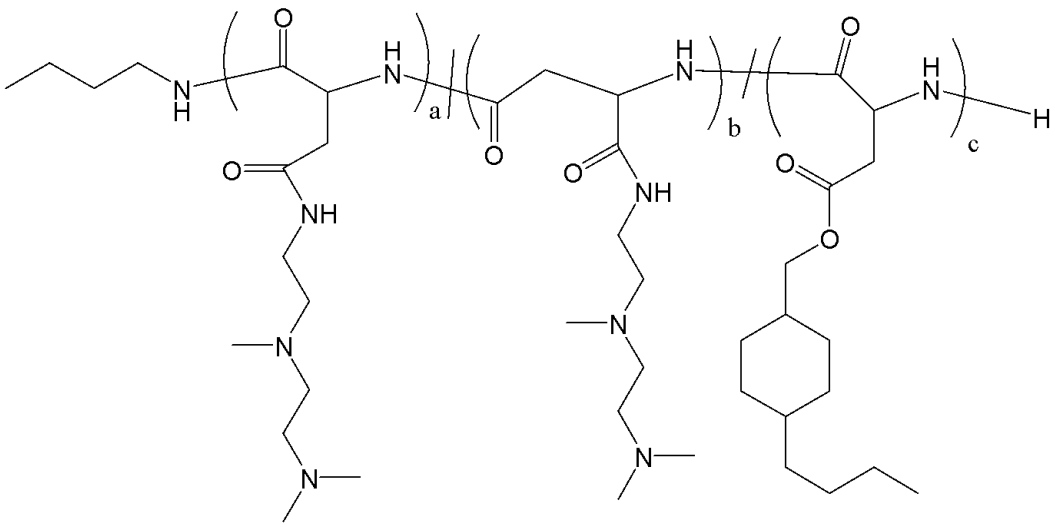
Polymer 24

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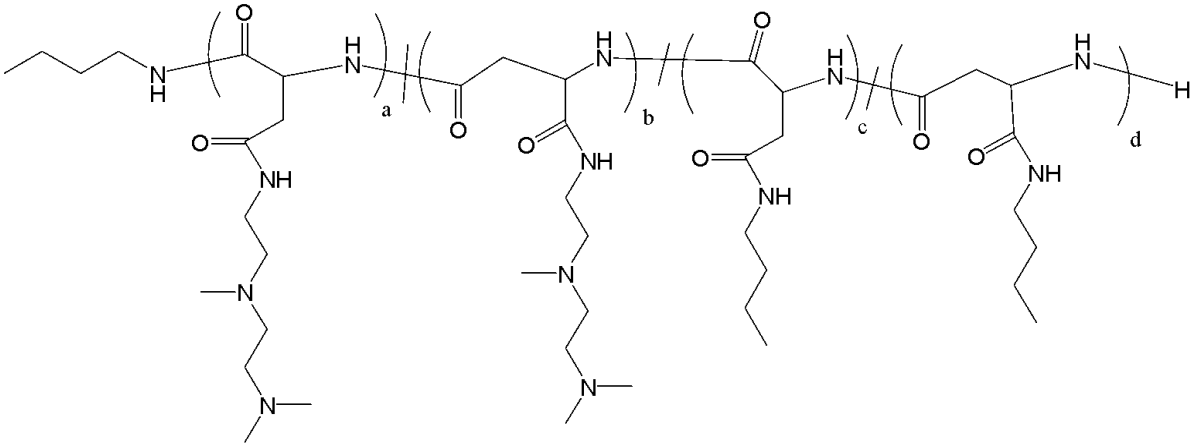
Polymer 25

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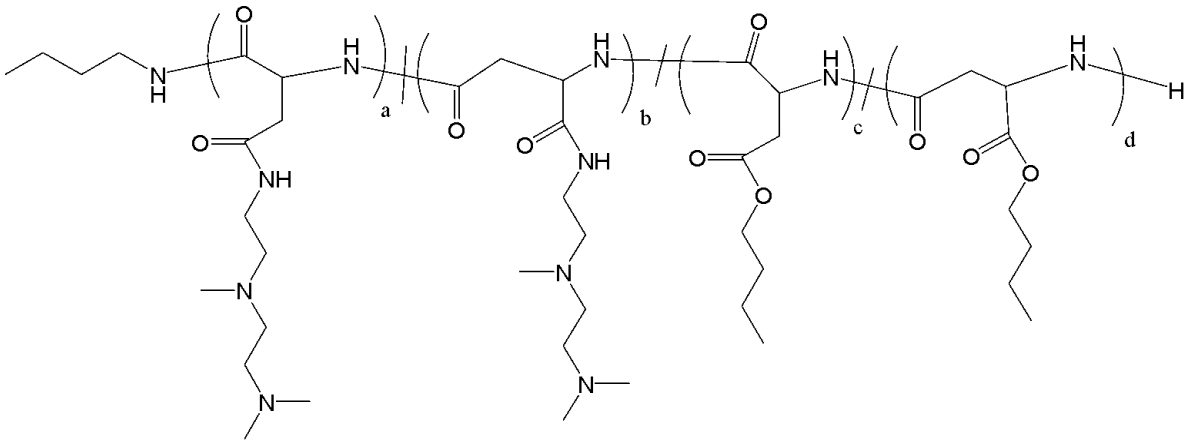
Polymer 26

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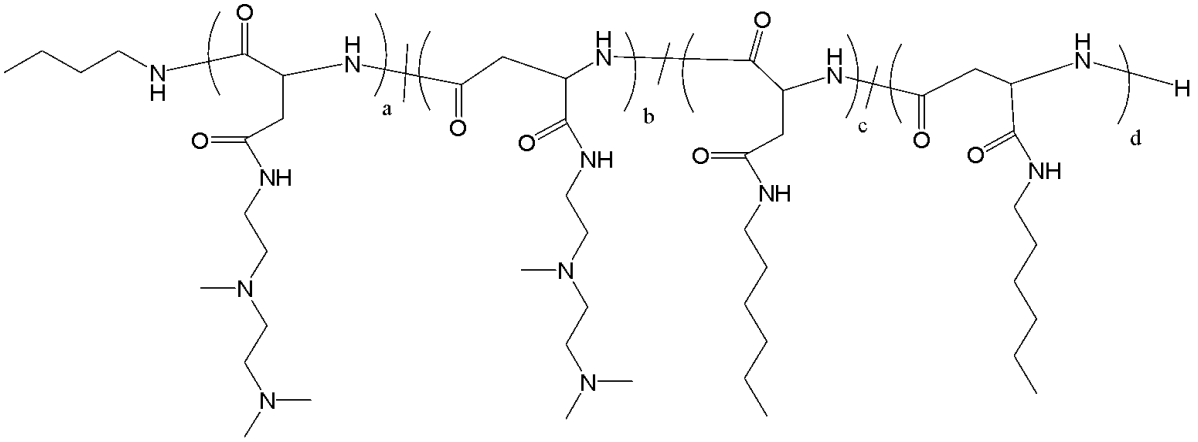
Polymer 27

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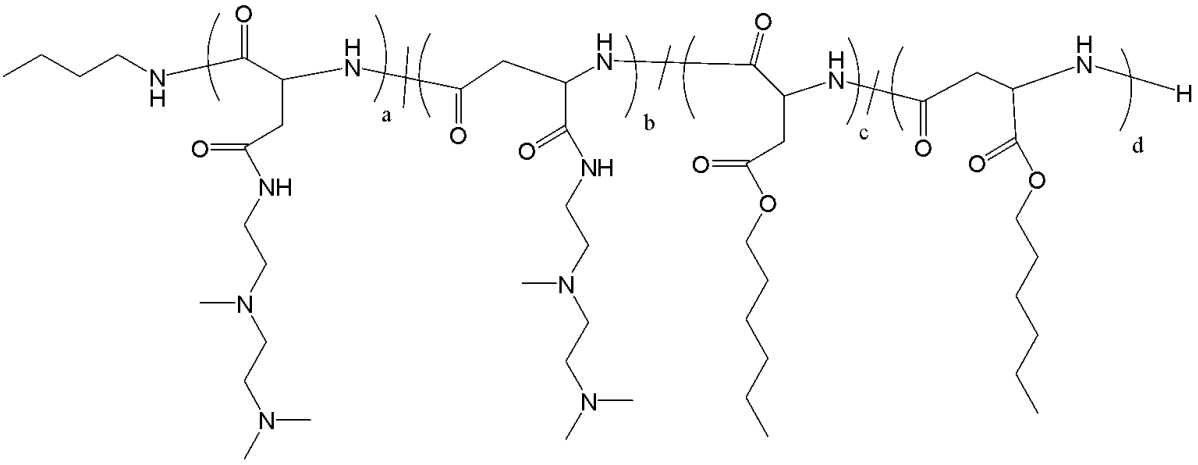
Polymer 28

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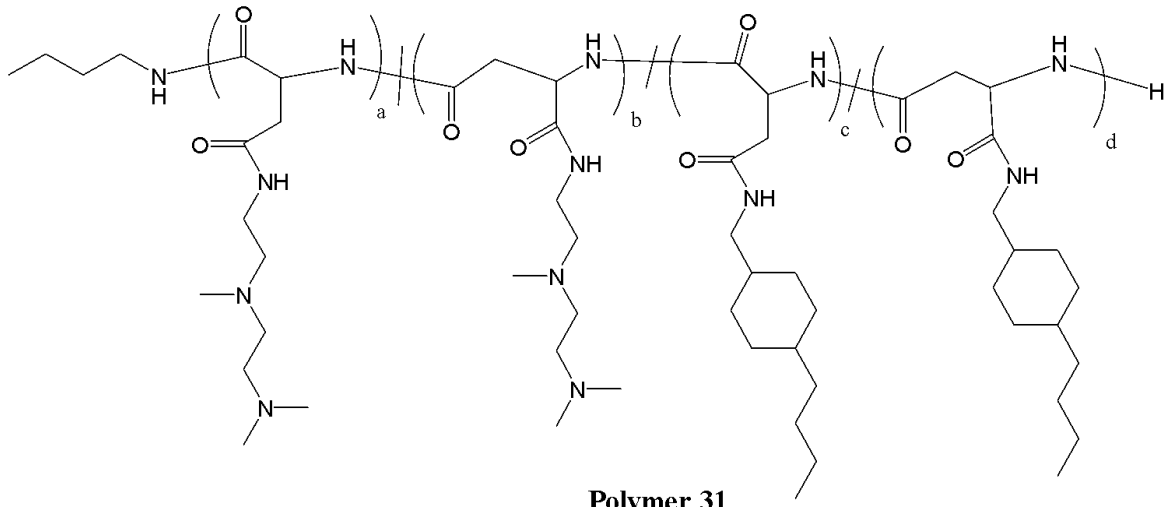
Polymer 29

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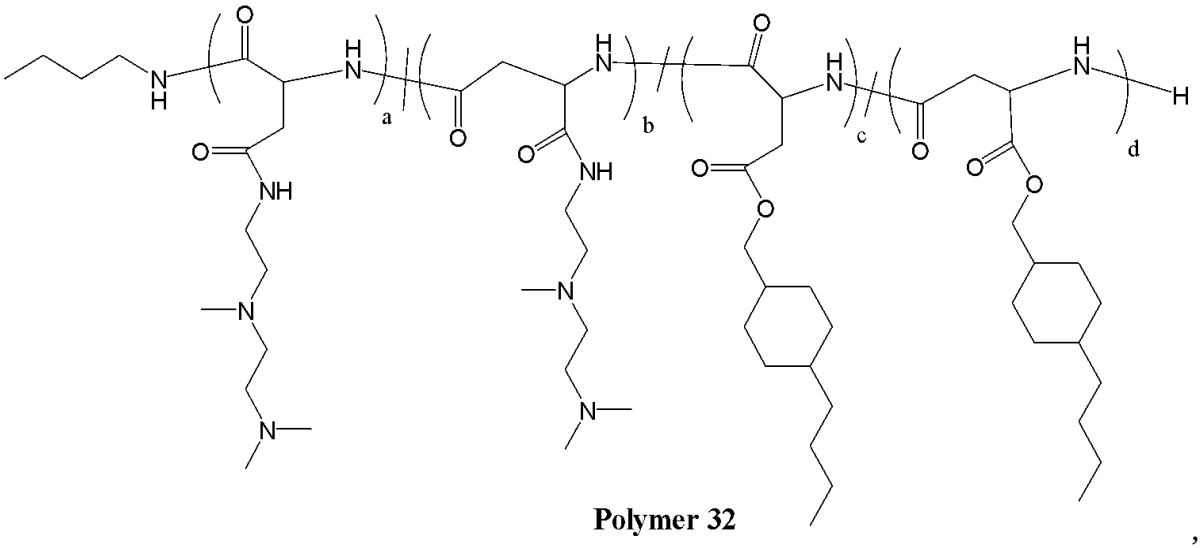
Polymer 30

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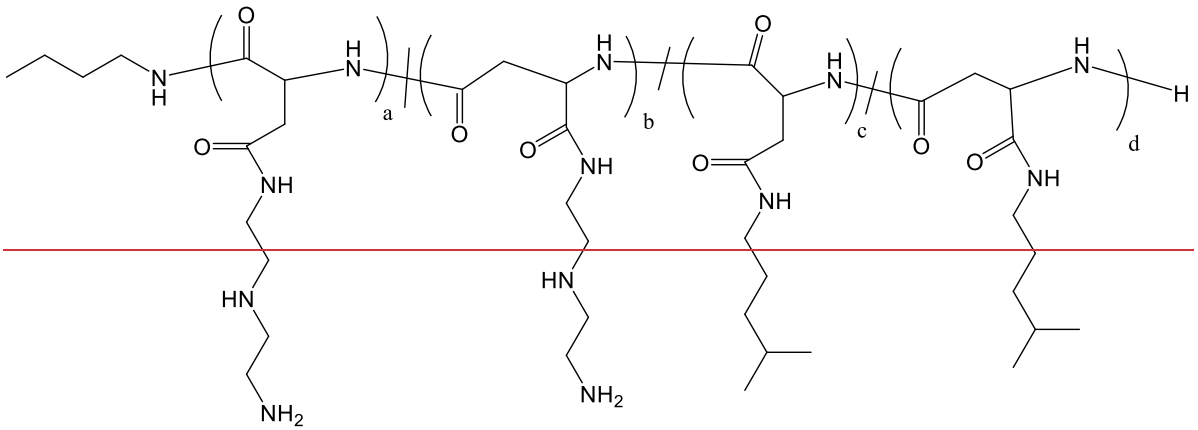
Polymer 31

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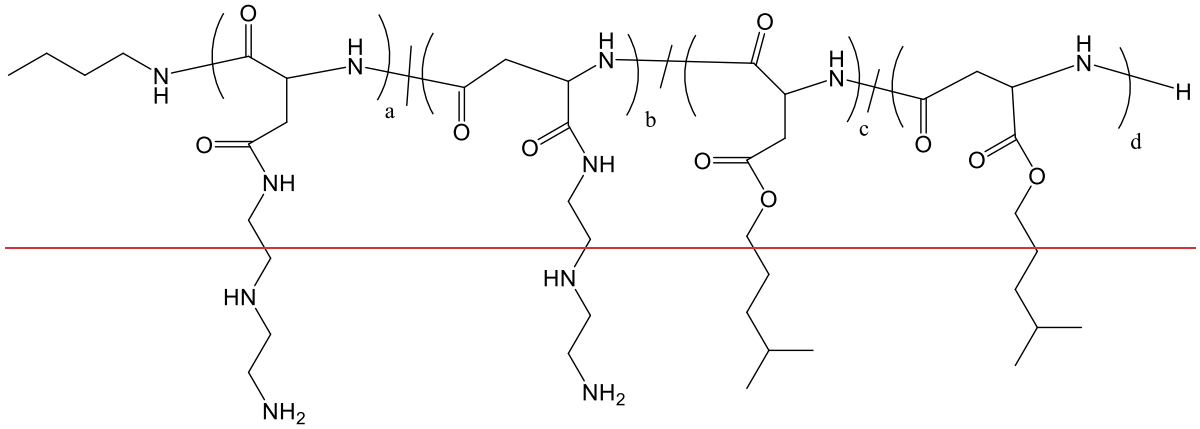


Polymer 32

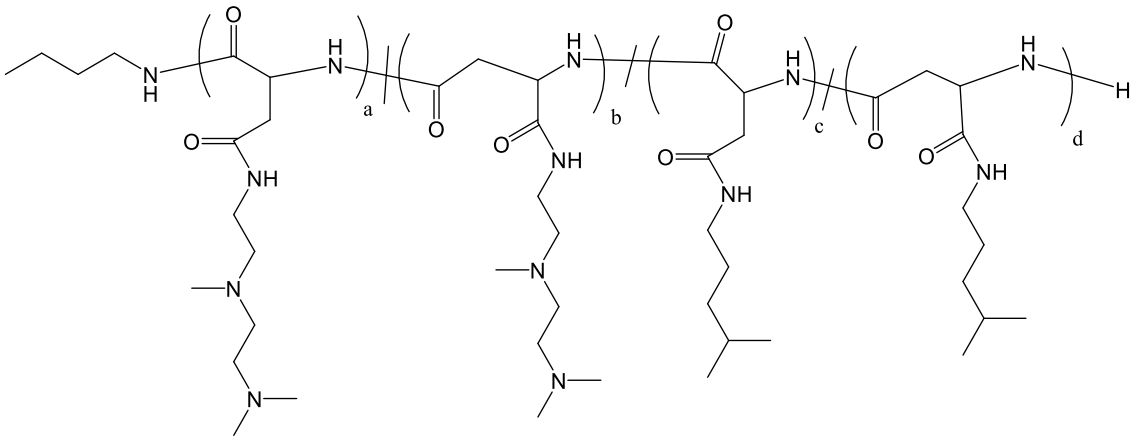
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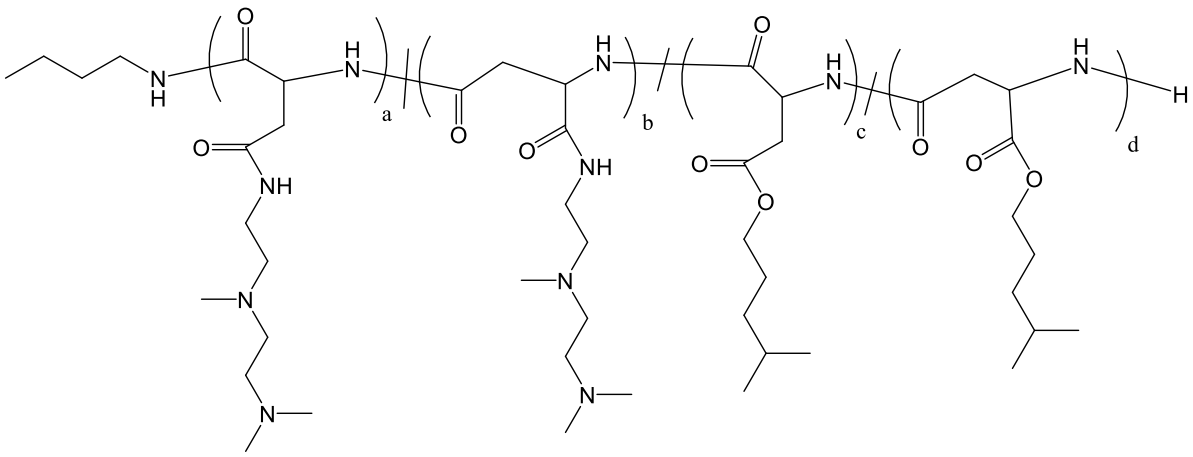
Polymer 33



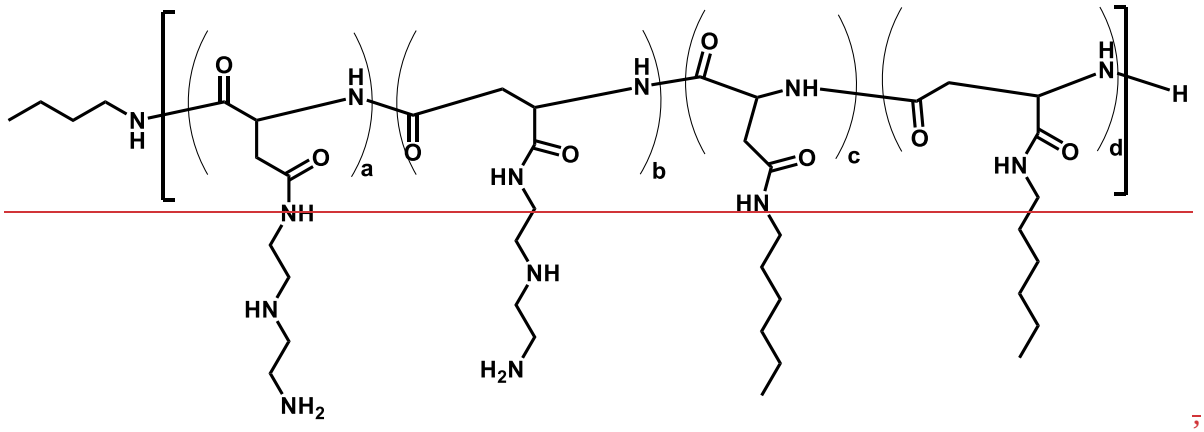
Polymer 34



Polymer 35

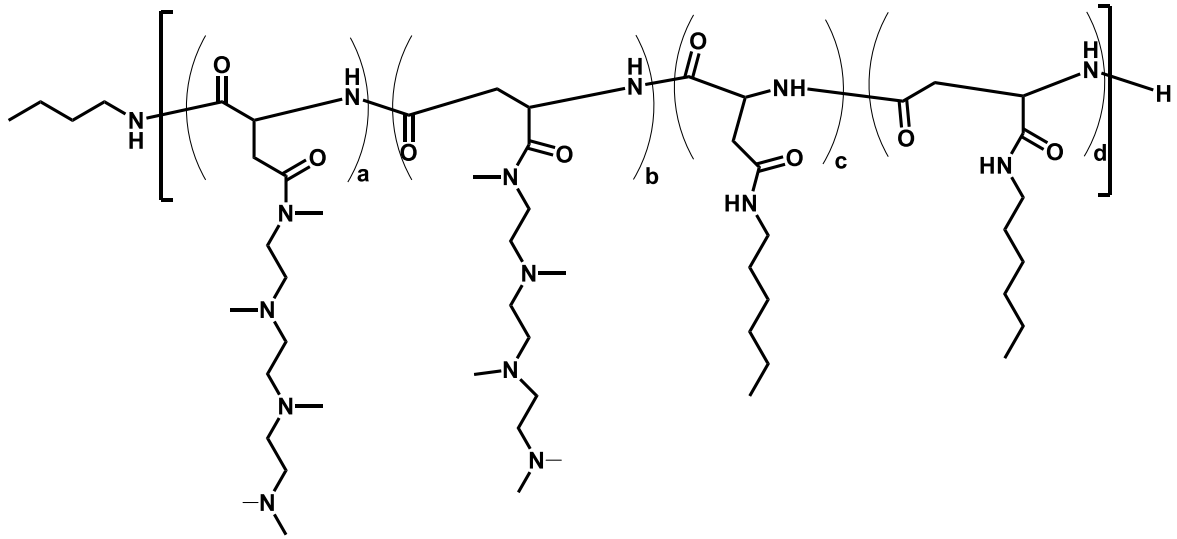


Polymer 36



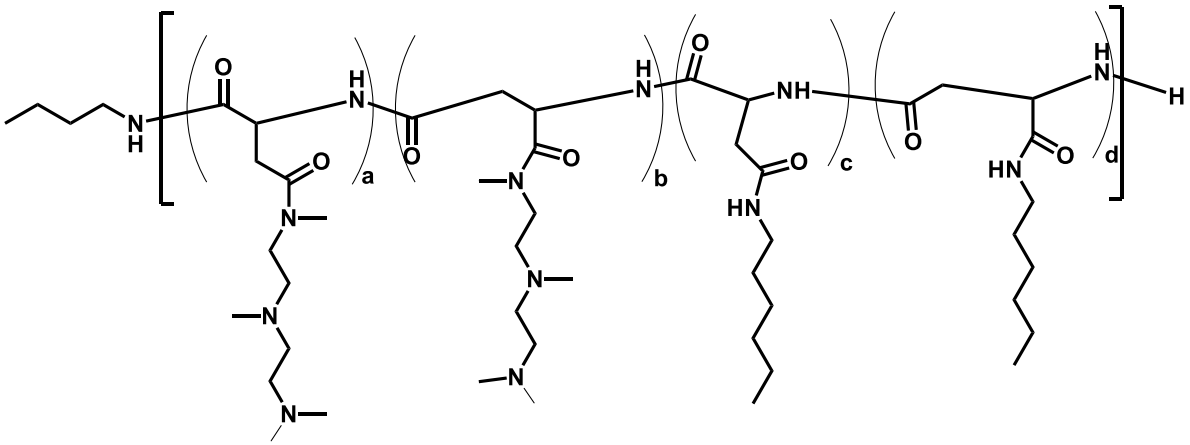
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~~Polymer 37~~



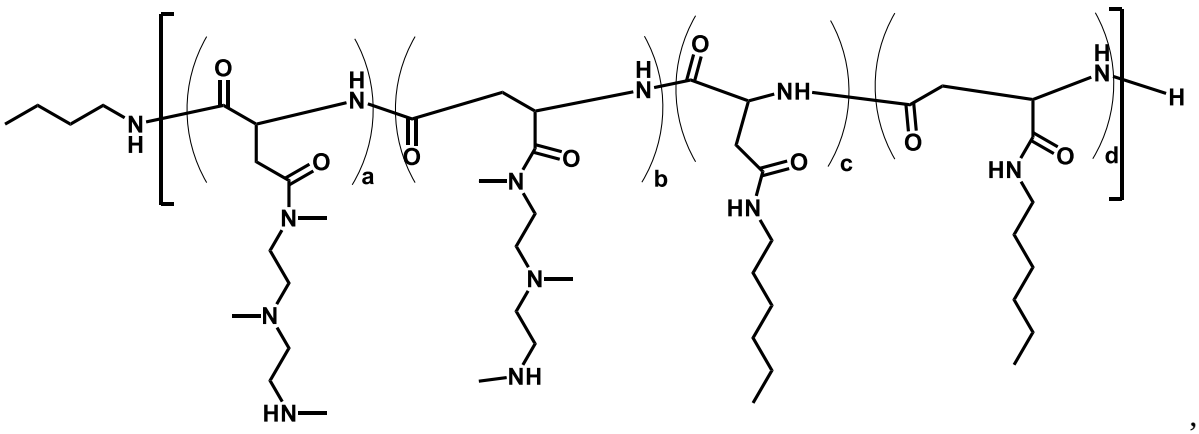
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Polymer 38

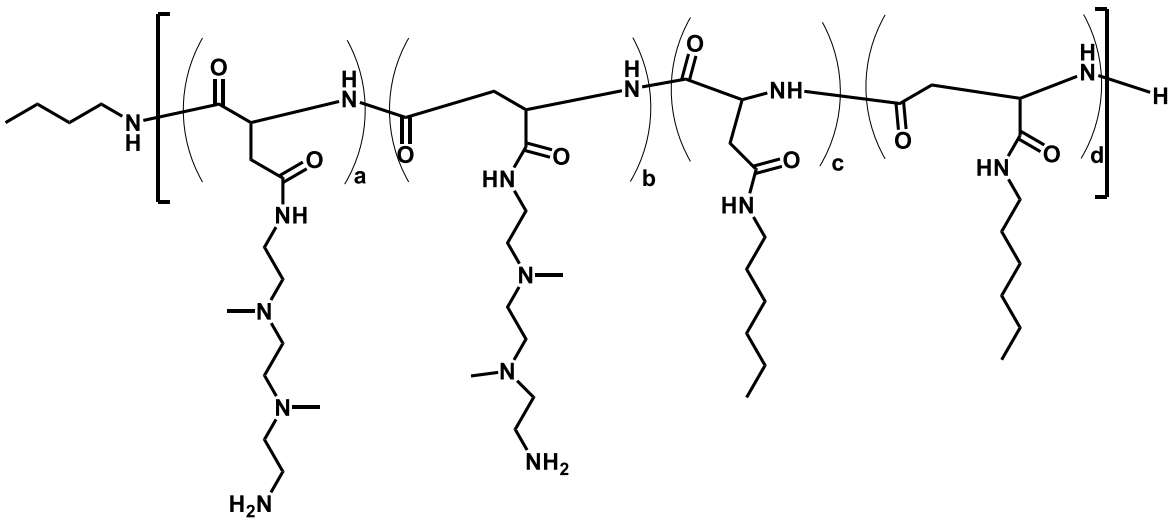


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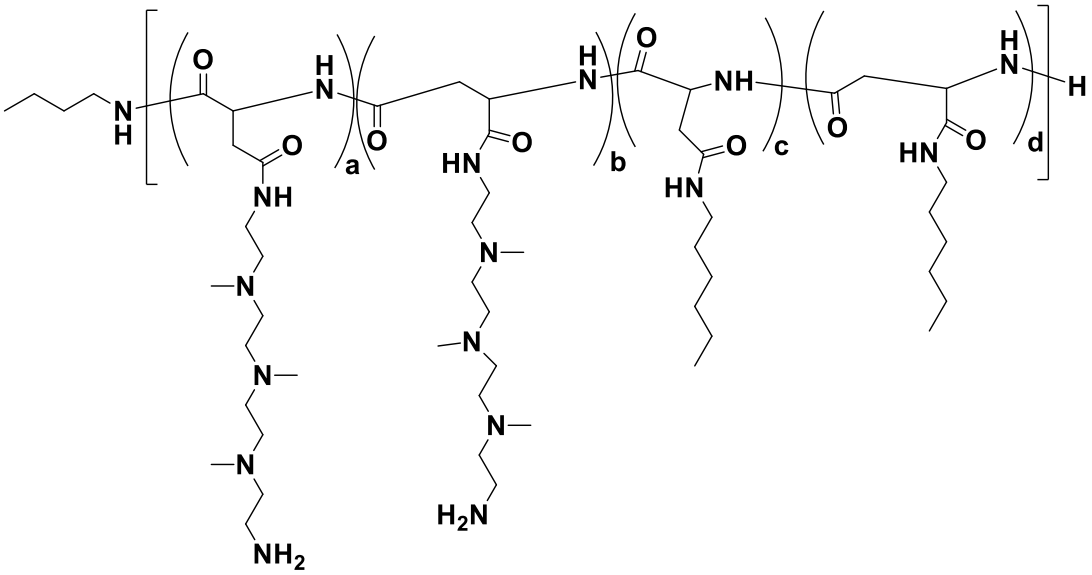
Polymer 39



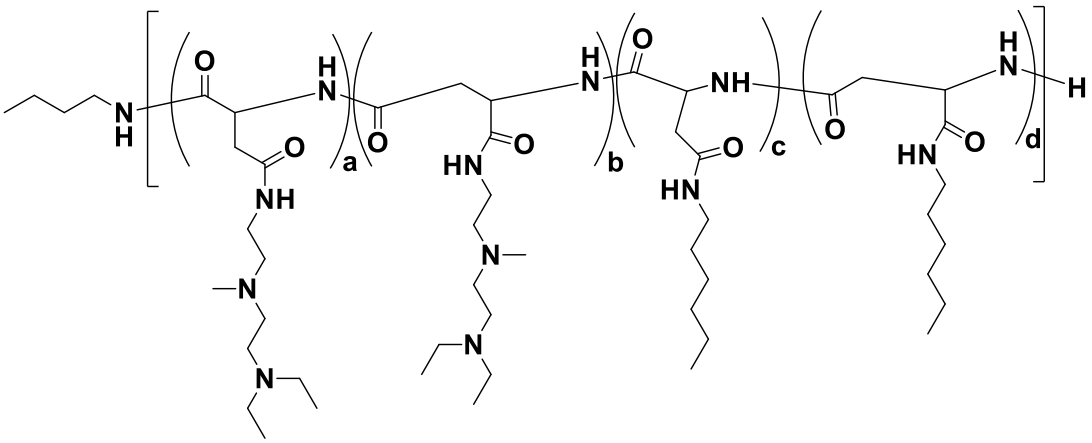
Polymer 40



Polymer 41

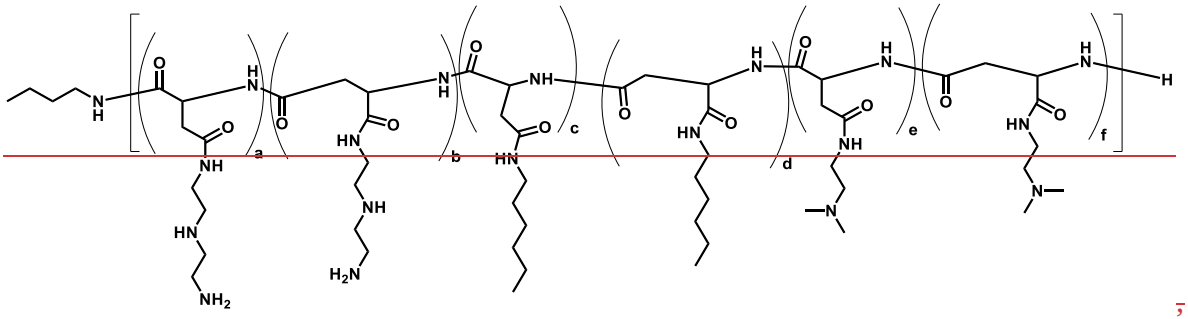


Polymer 42



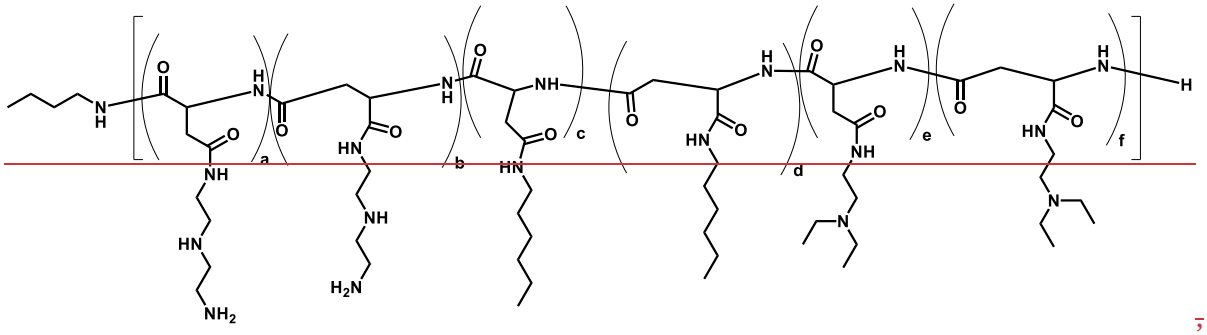
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Polymer 43



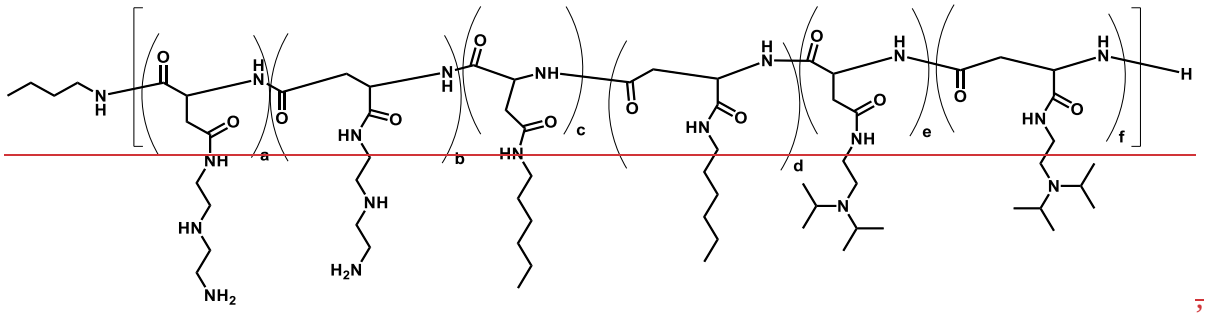
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~~Polymer 44~~



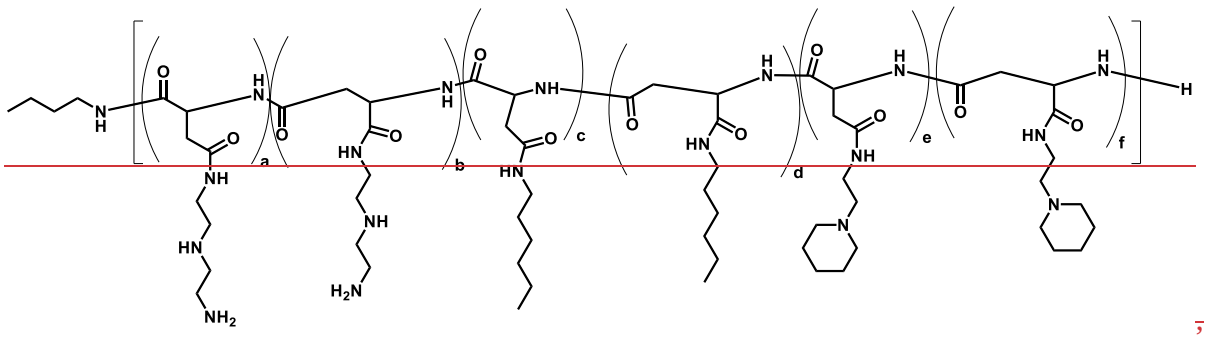
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~~Polymer 45~~

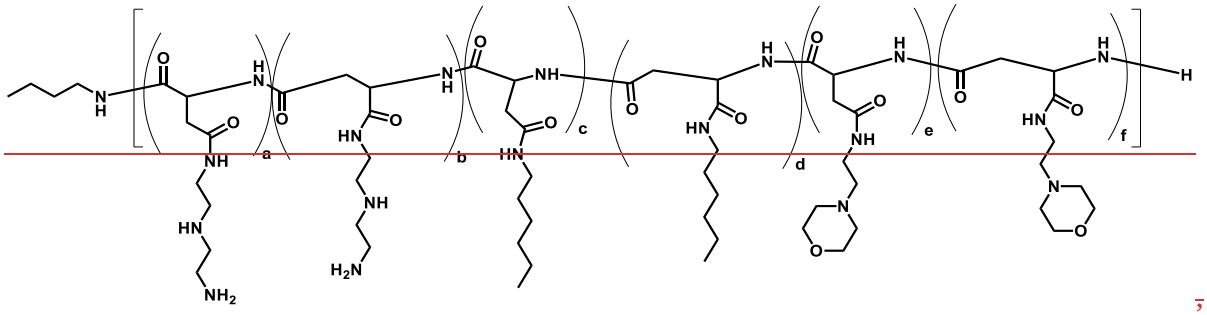


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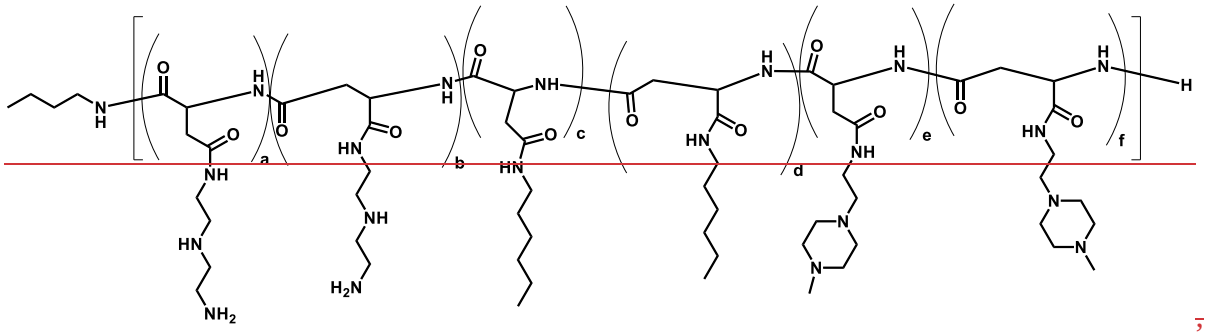
~~Polymer 46~~



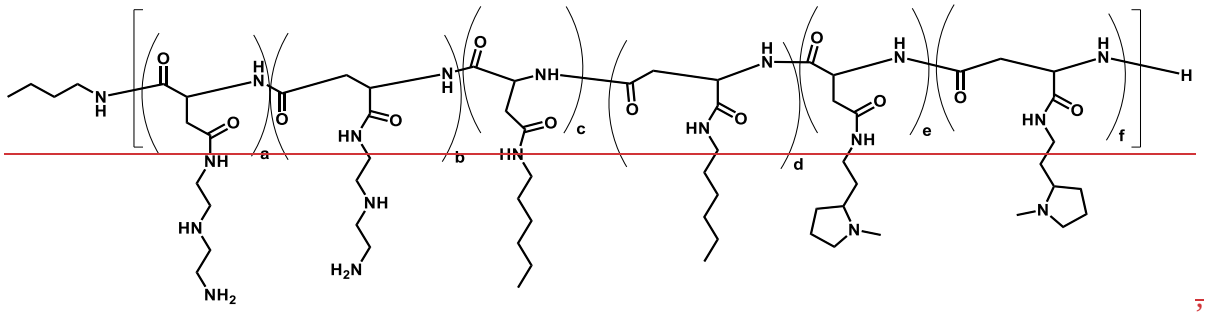
Polymer 47



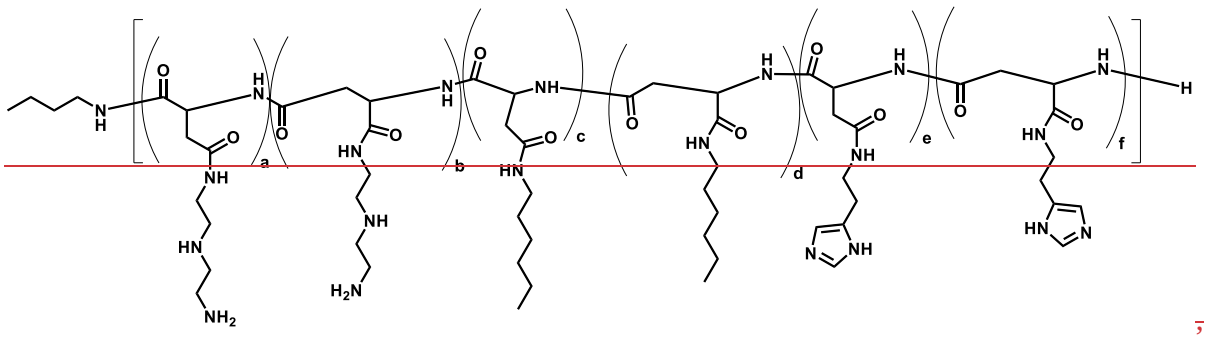
Polymer 48



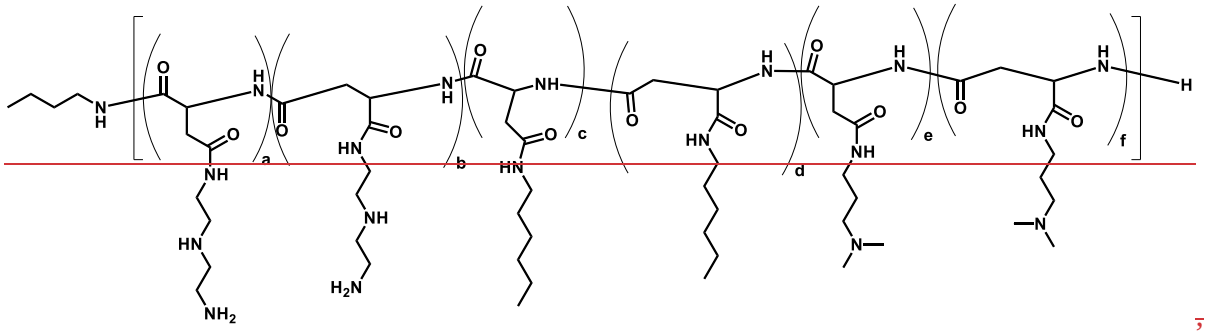
Polymer 49



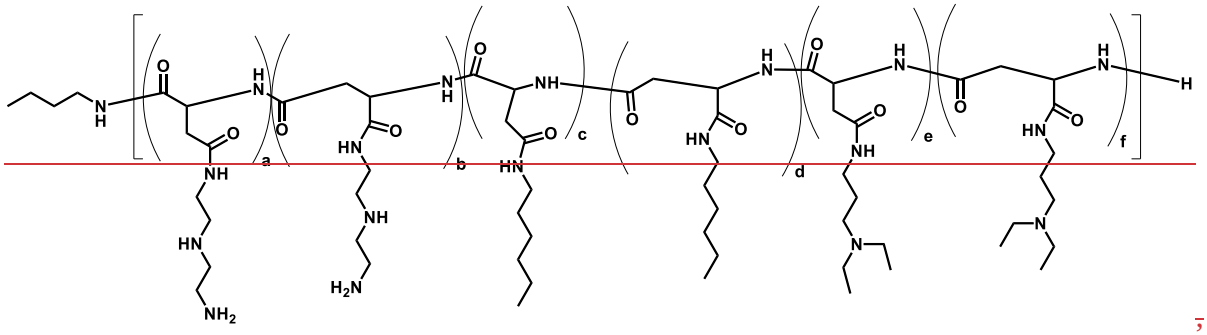
Polymer 50



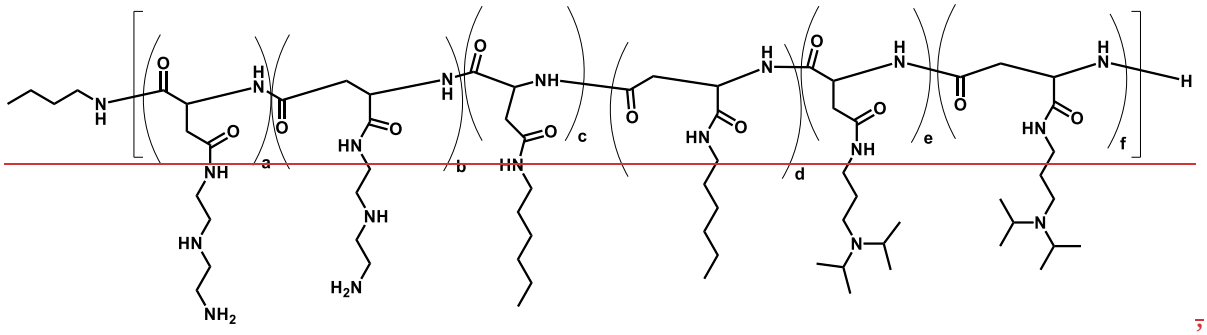
Polymer 51



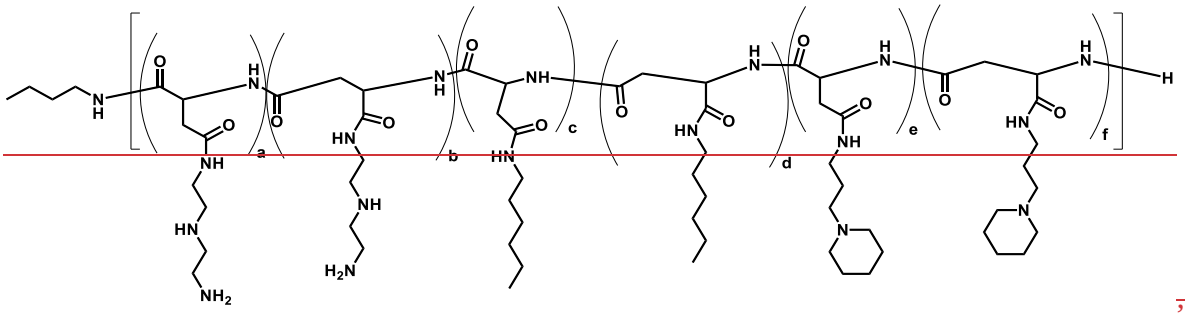
Polymer 52



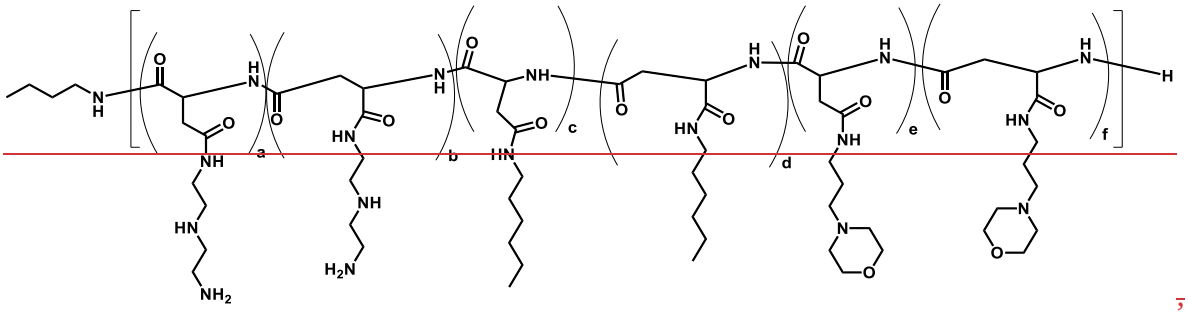
Polymer 53



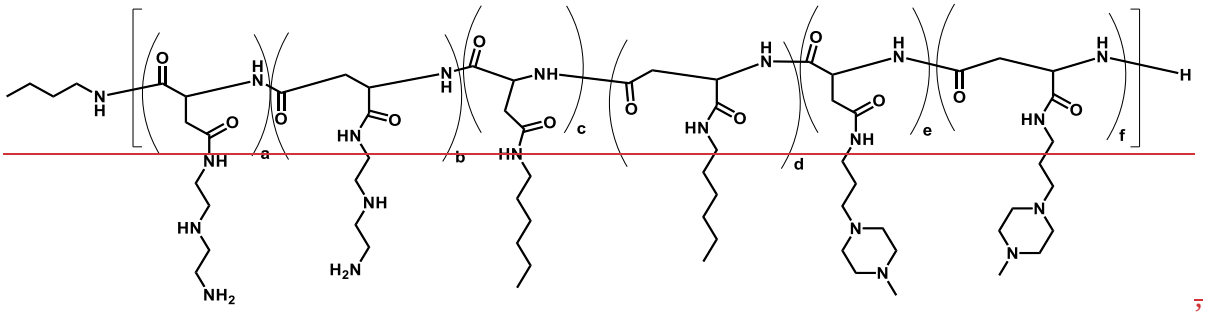
Polymer 54



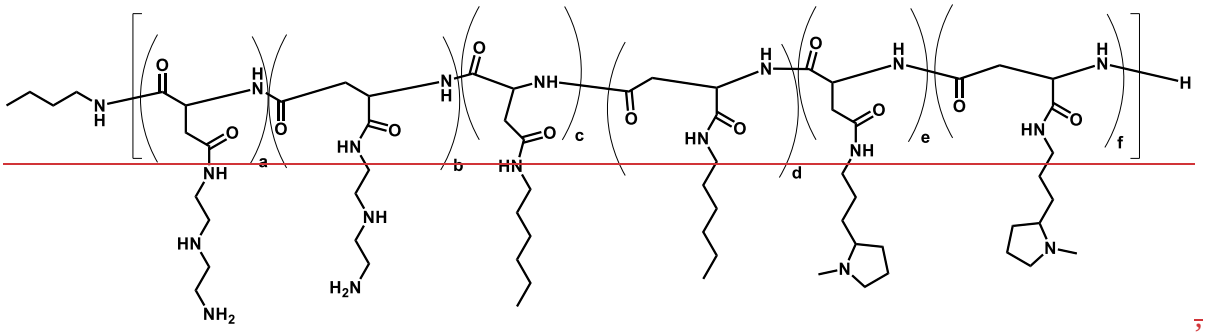
Polymer 55



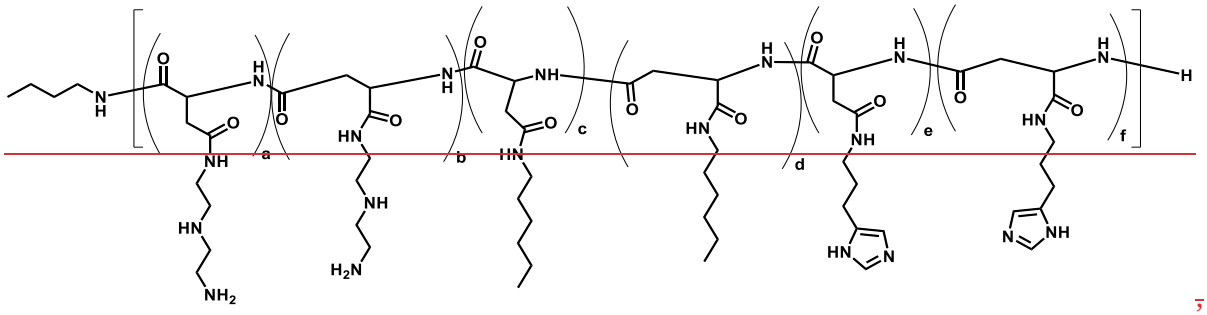
Polymer 56



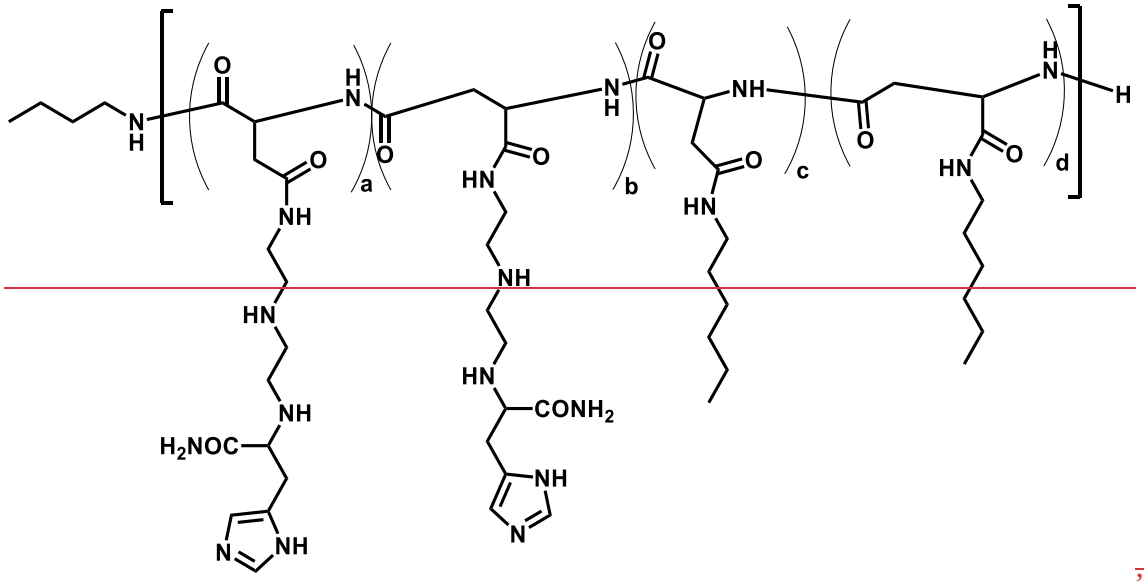
Polymer 57



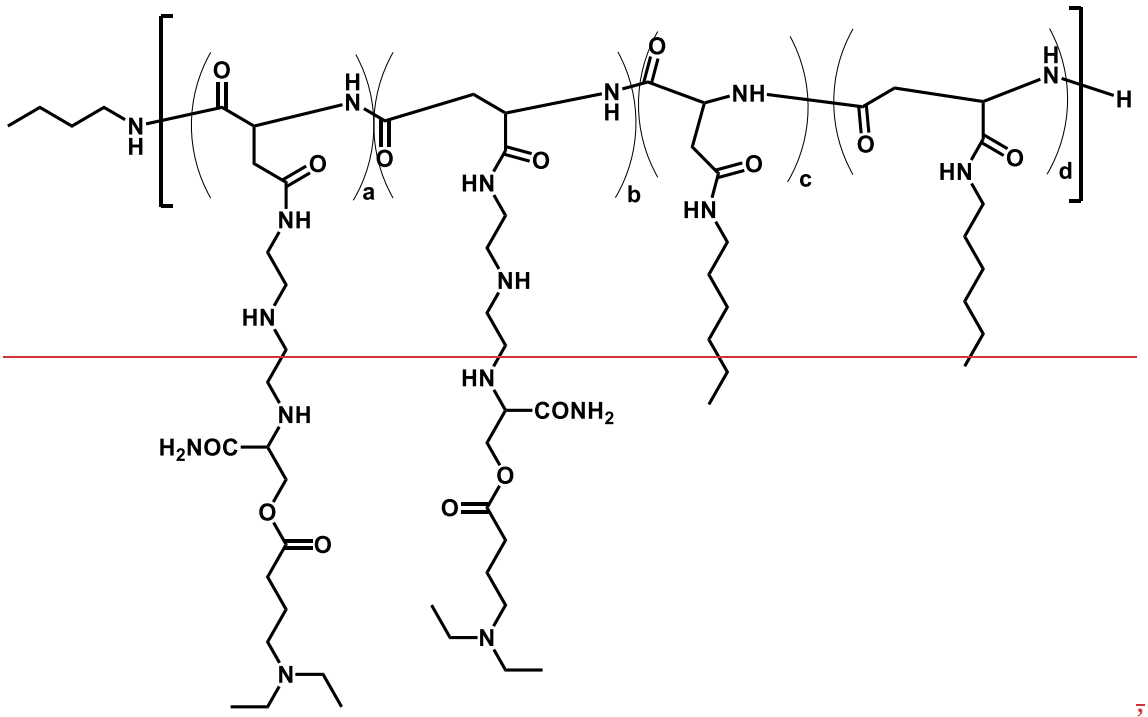
Polymer 58



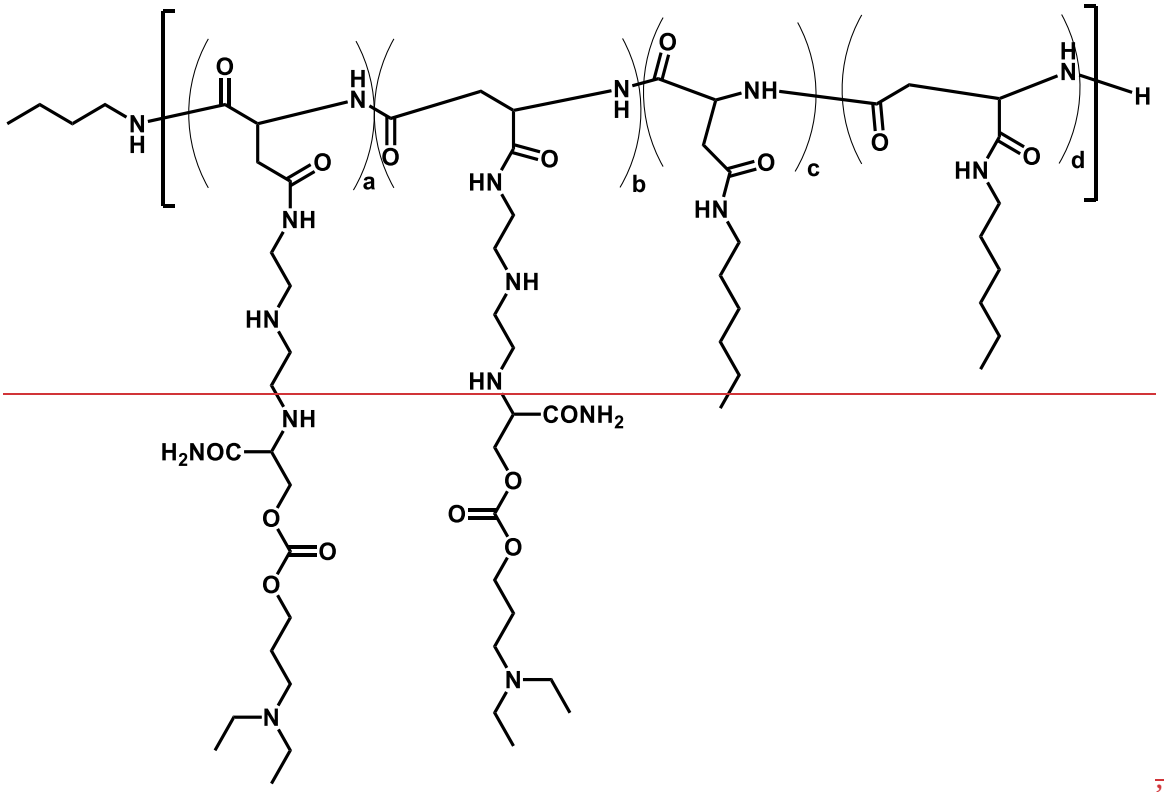
~~Polymer 59~~



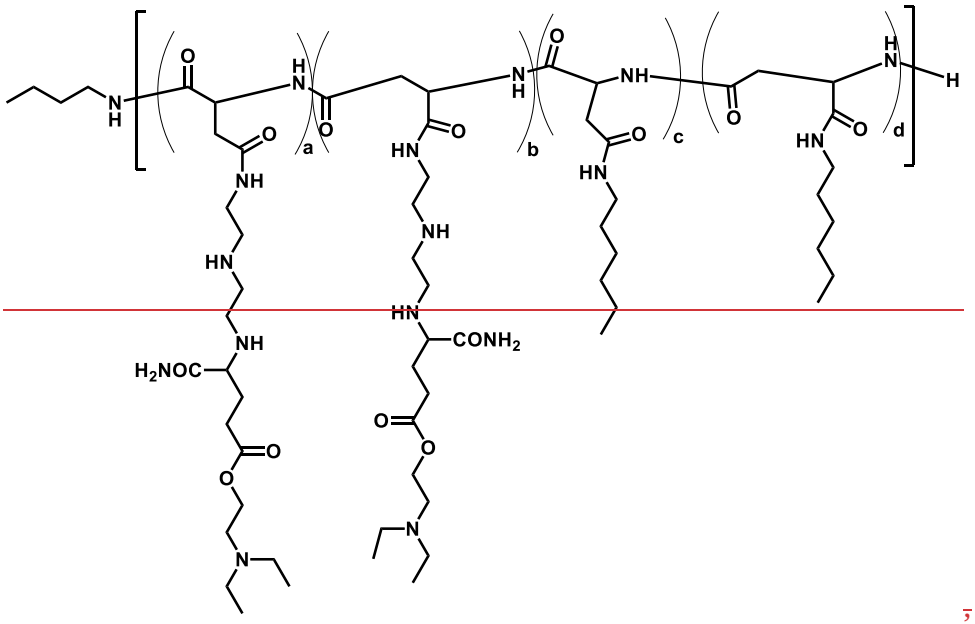
~~Polymer 60~~



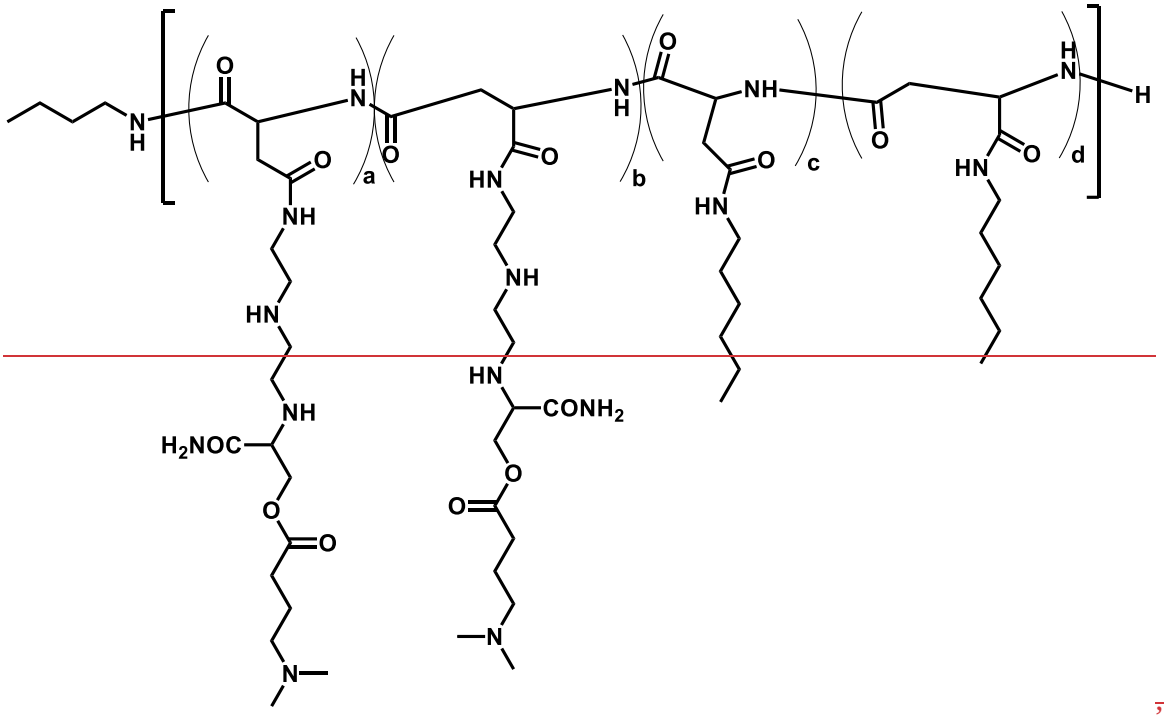
~~Polymer 61~~



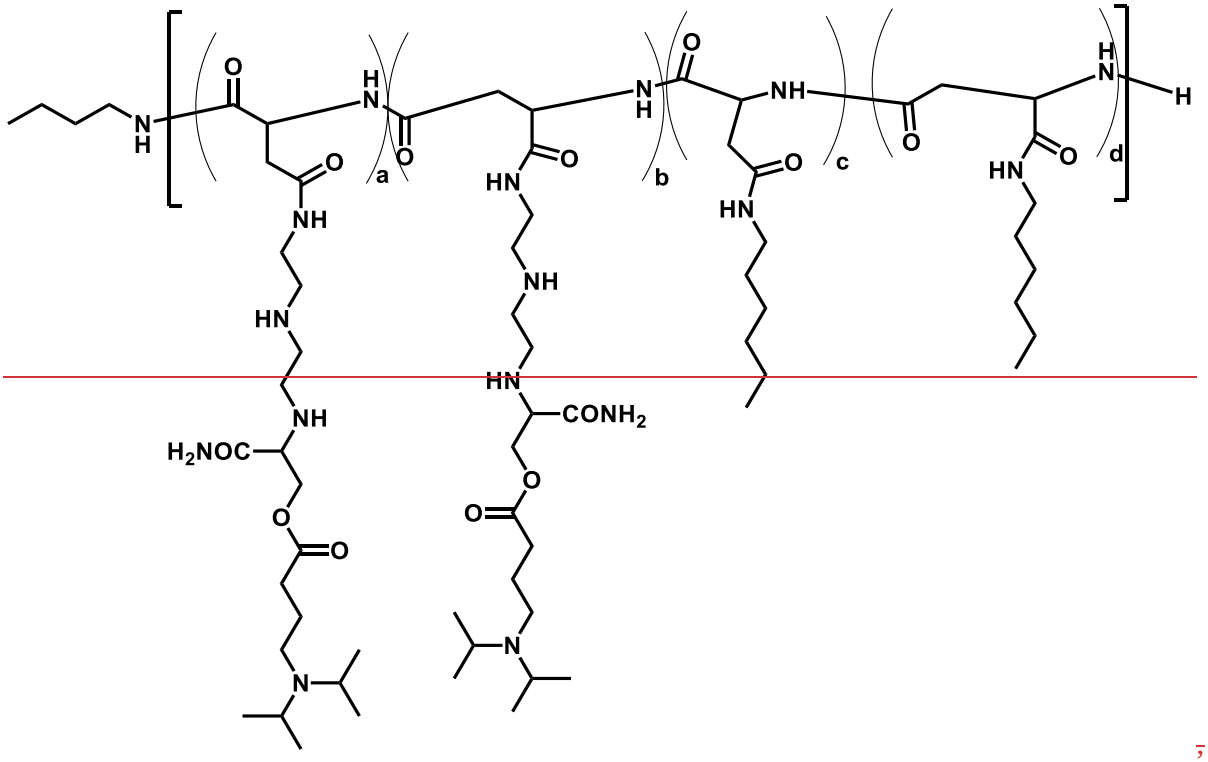
Polymer 62



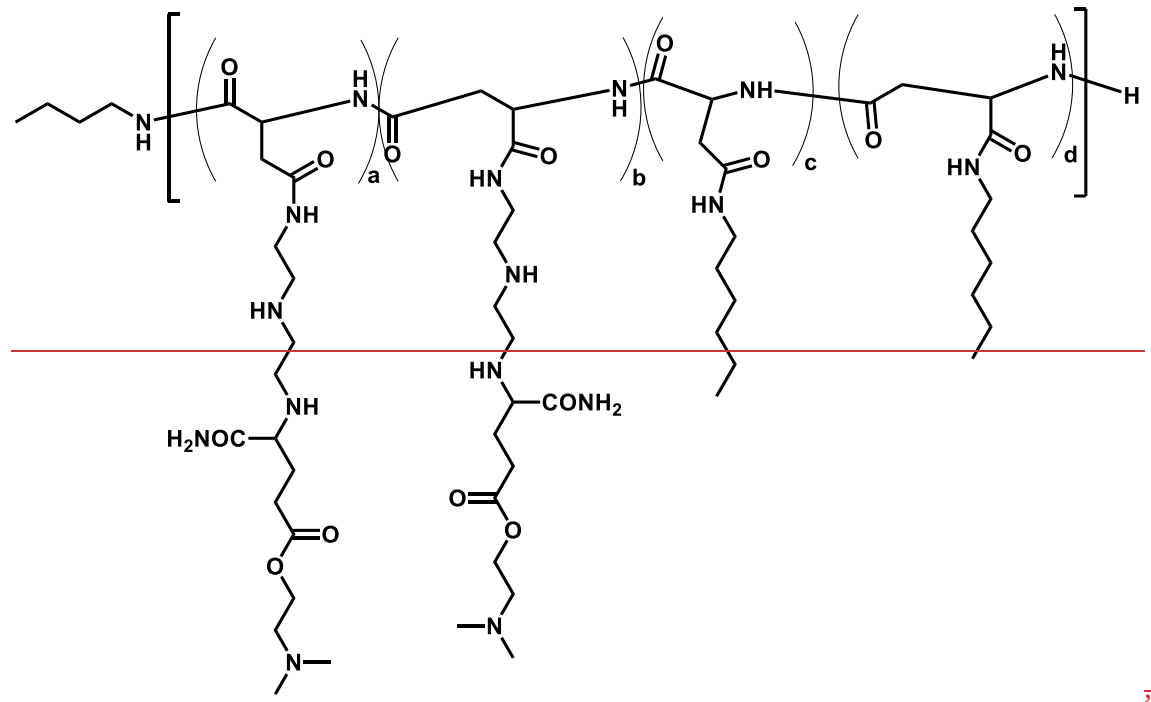
Polymer 63



Polymer 64

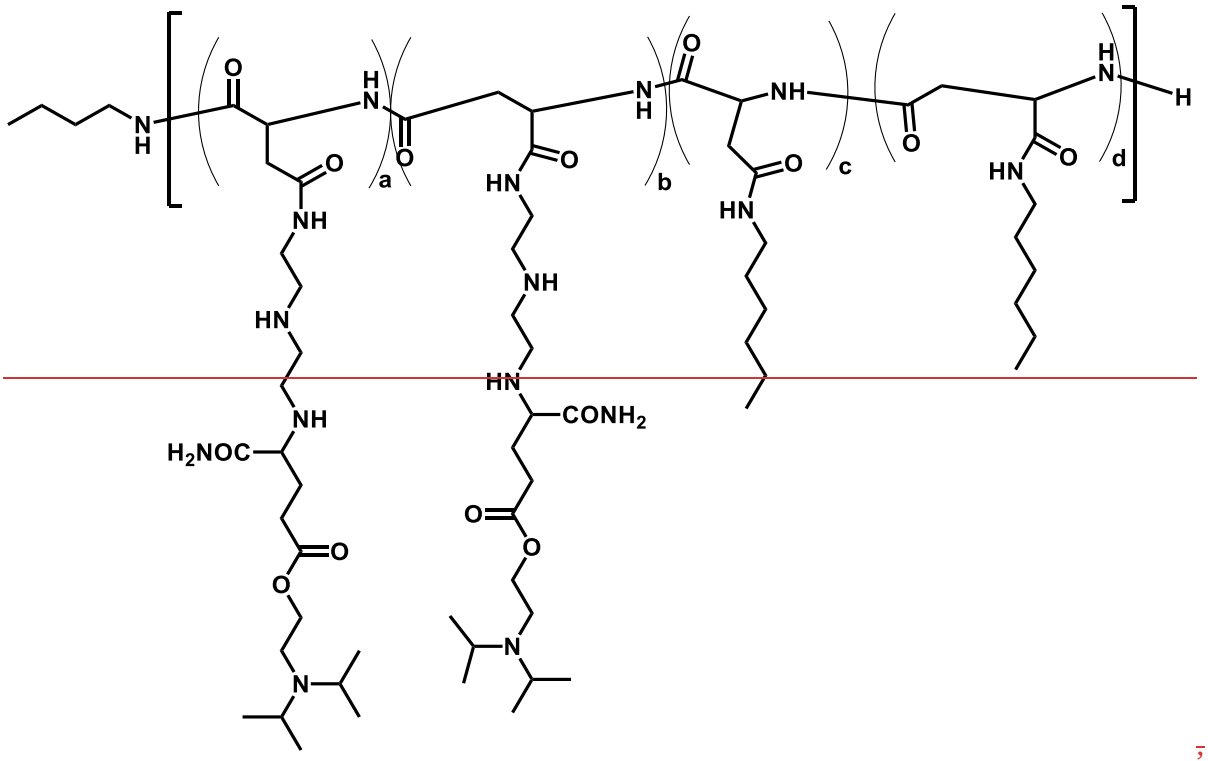


Polymer 65



~~, or~~

~~Polymer 66~~

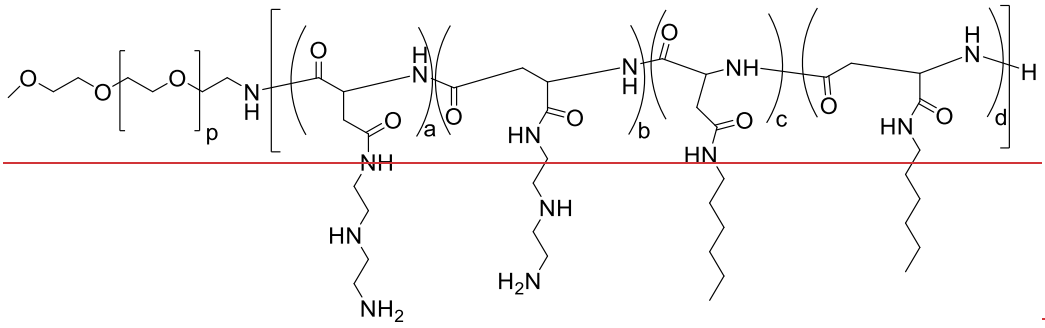


~~,~~

~~Polymer 67~~

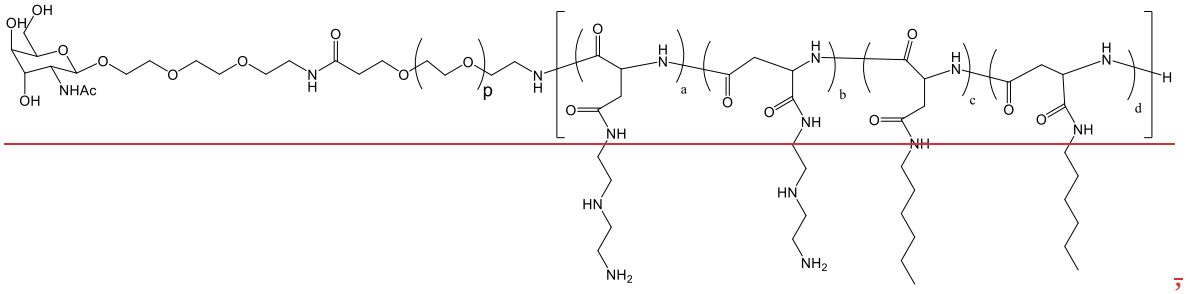
wherein (a+b) is from about 5 to about 65, and (c+d) is from about 2 to about 60~~, and (e+f) is from about 2 to about 60~~.

~~22. The polymer of claim 10, the polymer having the formula:~~



~~or~~

~~Polymer 68~~



~~;~~

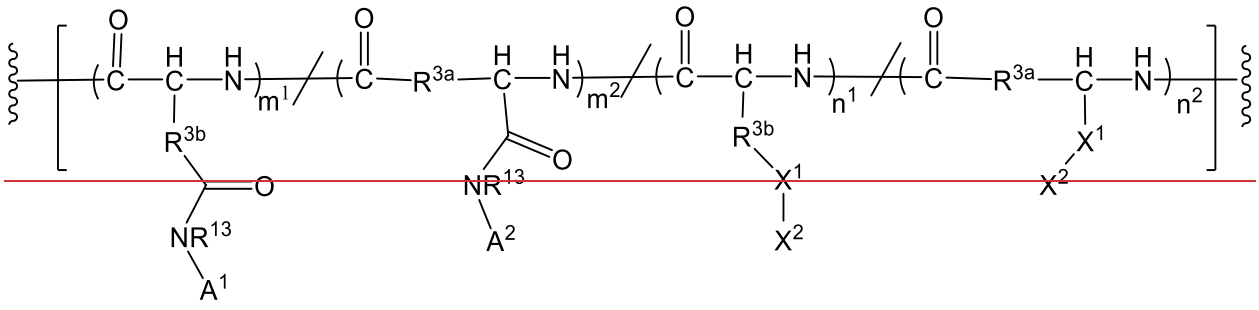
~~Polymer 69~~

~~wherein (a+b) is from about 5 to about 65, (c+d) is from about 2 to about 60, and each instance of p is independently an integer from 2 to 200.~~

~~23~~8. The polymer of any of claims 1-~~22~~7, wherein the polymer is a cationic polymer.

~~24. A method of preparing a polymer of Formula 1 according to claim 10, the method comprising:~~

~~(a) providing a polymer of Formula 4:~~

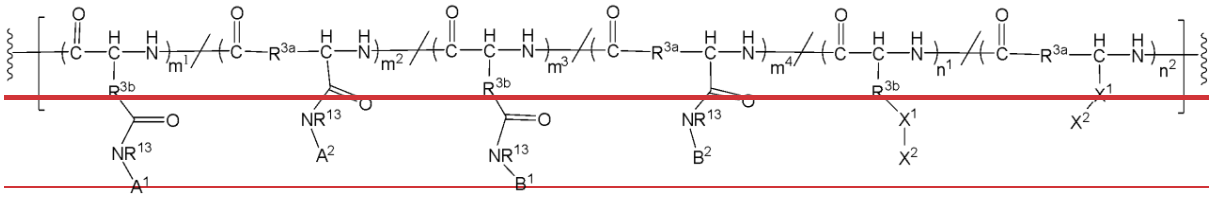


Formula 4

and

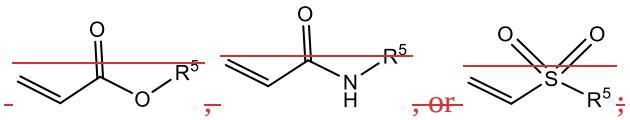
(b) modifying a portion of groups A^1 and/or A^2 of the polymer of Formula 4

to provide the polymer of Formula 1:



wherein m^1, m^2, m^3, m^4, n^1, n^2 R^{3a}, R^{3b}, R^{13}, X^1, X^2, A^1, A^2, B^1, and B^2 of Formulas 1 and 4 are as defined in claim 10.

25. The method of claim 21, wherein: modifying a portion of groups A^1 and/or A^2 of the polymer of Formula 4 comprises reacting a portion of groups with a compound having the structure:



to provide the polymer of Formula 1;

wherein A^1 and A^2 are each independently a group of formula

$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2{}_2$;

$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2{}_2]_2$;

$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2{}_2][-(CH_2)_{q4}-NR^2-]_{r2}R^2\}$; or

$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2{}_2]_2\}_2$;

in which B^1 and B^2 are:

$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-(CH_2)_{s1}-R^4-R^5$;

$-(CH_2)_{p2}-N[-(CH_2)_{q2}-NR^2-(CH_2)_{s2}-R^4-R^5]_2$;

~~$-(CH_2)_{p3}-N\{[-(CH_2)_{q3}-NR^2{}_2][-(CH_2)_{q4}-NR^2-]_{r2}(CH_2)_{s3}-R^4-R^5\};$~~

~~$-(CH_2)_{p4}-N\{-(CH_2)_{q5}-N[-(CH_2)_{q6}-NR^2-(CH_2)_{s4}-R^4-R^5]_2\}_2;$~~

~~$-(CH_2)_{p1}-[N\{(CH_2)_{s1}-R^4-R^5\}-(CH_2)_{q1}-]_{r1}NR^2{}_2;$~~

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-CH(CONH_2)-(CH_2)_{s1}-R^4-R^5.$~~

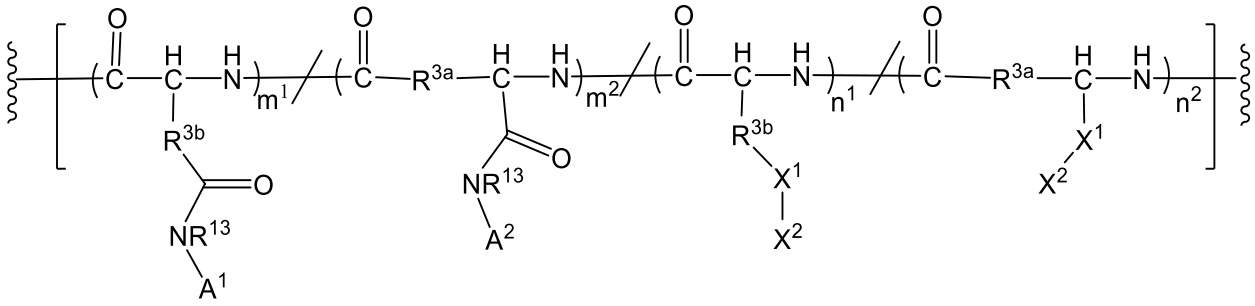
~~26. The method of claim 25, wherein wherein A^1 and A^2 are both:~~

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2{}_2;$~~

~~and B^1 and B^2 are both:~~

~~$-(CH_2)_{p1}-[NR^2-(CH_2)_{q1}-]_{r1}NR^2-(CH_2)_{s1}-R^4-R^5.$~~

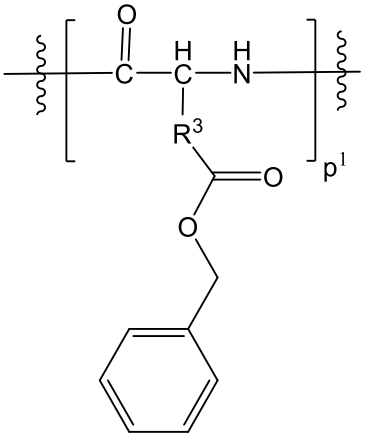
~~27~~9. A method of preparing a polymer of Formula 4 according to claim ~~18~~1:



Formula 4

the method comprising:

(I) reacting a polymer of Formula 2:

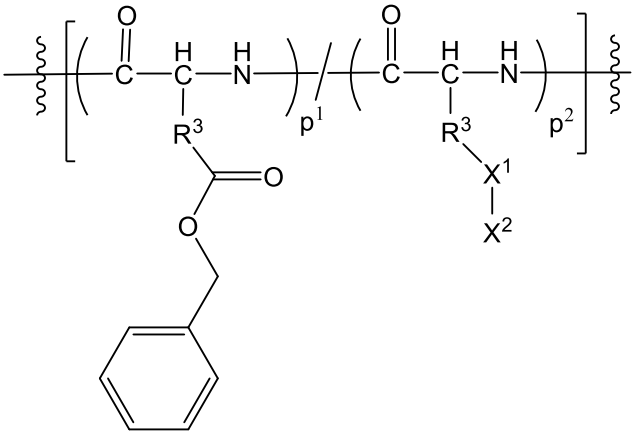


Formula 2

with (a) a compound of the formula $HNR^{13}A^1$ and/or $HNR^{13}A^2$; and (b) a compound of formula H_2NX^2 or HOX^2, simultaneously or in any sequential order;

or

(II) reacting a polymer of Formula 3



Formula 3

with a compound of the formula $HNR^{13}A^1$ and/or $HNR^{13}A^2$;

wherein,

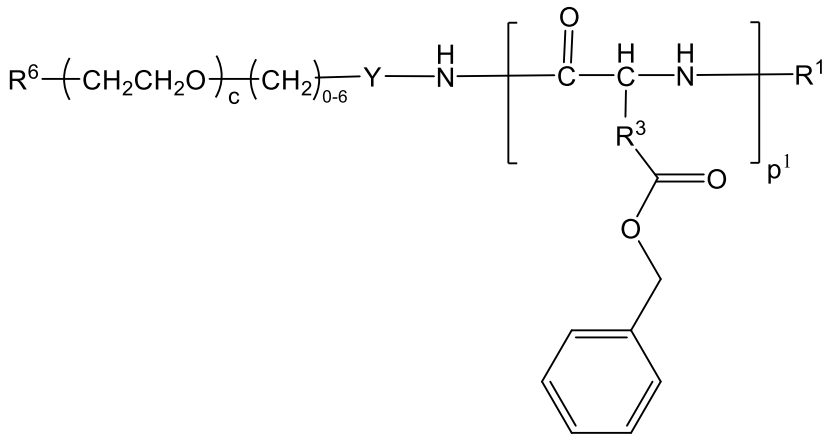
p^1 is an integer from 1 to 2000;

p^2 is an integer from 1 to 2000;

each R^3 is independently a methylene or ethylene group;

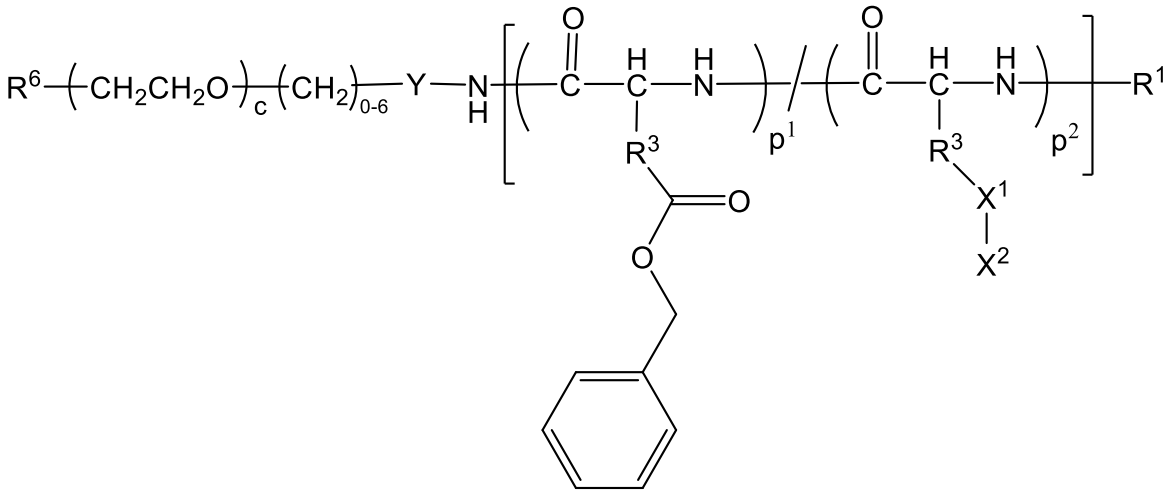
and m^1, m^2, n^1, n^2, R^{3a} , R^{3b} , R^{13}, X^1, X^2, A^1, and A^2 are as defined in claim ~~10~~1.

~~28~~10. The method of claim ~~27~~9, wherein the polymer comprising the structure of Formula 2 or Formula 3 is a polymer of Formula 2A or Formula 3A, respectively:



Formula 2A

or



Formula 3A

;

wherein,

p^1 is an integer from 1 to 2000;

p^2 is an integer from 1 to 2000;

each R^3 is independently a methylene or ethylene group;

each X^1 independently is —C(O)O—, —C(O)NR^{13}—, —C(O)—, —S(O)(O)—, or a bond;

each instance of X^2 is independently a C_1-C_{12} alkyl group, cycloalkyl group, alkenyl group, cycloalkenyl group, aryl group, heteroalkyl group, heterocyclic group, or combination thereof optionally comprising one or more primary, secondary, or tertiary amines; any of which can be substituted with one or more substituents;

c is an integer from 0 to 50;

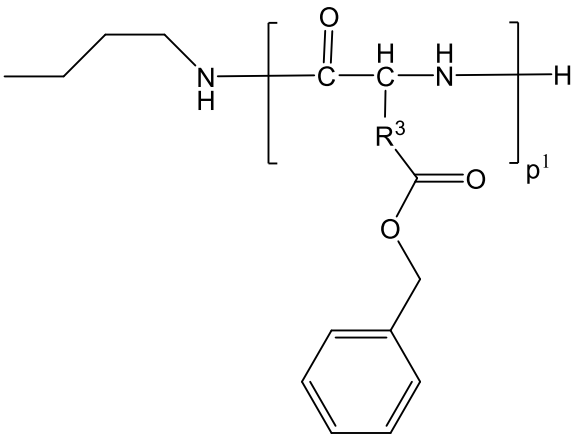
Y is optionally present and is a cleavable linker;

R^1 is hydrogen, an aryl group, a heterocyclic group, a C_1-C_{12} alkyl group, alkenyl group, cycloalkyl group, or cycloalkenyl group, or a C_1-C_{12} linear or branched alkyl group optionally substituted with one or more substituents; and

R^6 is hydrogen, an amino group, an aryl group, a heterocyclic group, a C_1-C_{12} alkyl group, a C_1-C_{12} heteroalkyl group, alkenyl group, cycloalkyl group, or cycloalkenyl group, a C_1-C_{12} linear or branched alkyl group optionally substituted with one or more amines; or a tissue-specific or cell-specific targeting moiety;

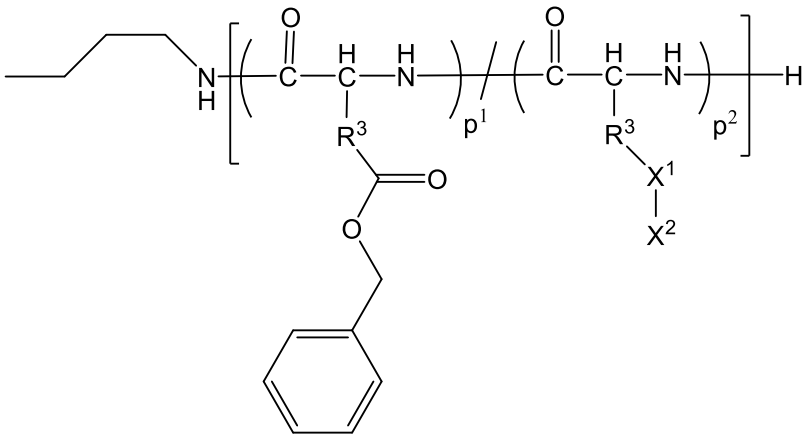
and p^1, p^2, R^3, X^1, and X^2 are as defined in claim ~~27~~9.

~~29~~11. The method of claim ~~27~~9, wherein the polymer comprising the structure of Formula 2 or Formula 3 is a polymer of Formula 2B or Formula 3B, respectively:



Formula 2B

or



Formula 3B

;

wherein,

and p^1, p^2, R^3, X^1, and X^2 are as defined in claim ~~27~~9.

~~30~~12. The method of claim ~~27~~ 9 comprising combining a compound of Formula 2 with (a) a compound of $HNR^{13}A^1$ and/or $HNR^{13}A^2$, and (b) compound of formula H_2NX^2 or HOX^2, wherein (a) and (b) are present in a molar ratio of about 1:10 to about 1:150, optionally about 1:40 to about 1:150, or about 1:80 to about 1:150.

~~31~~13. A composition comprising a polymer of any one of claims 1-~~22~~ 8 and a nucleic acid and/or polypeptide.

~~32~~14. The composition of claim ~~31~~13, wherein the composition comprises a guide nucleic acid and/or donor nucleic acid.

~~33~~15. The composition of claim ~~31~~ 13 or ~~32~~14, wherein the composition comprises an endonuclease.

~~34~~16. The composition of claim ~~33~~15, wherein the composition comprises an RNA-guided endonuclease or nucleic acid encoding same.

~~35~~17. The composition of claim ~~34~~16, wherein the RNA-guided endonuclease is Cas9, Cpf1, or a combination thereof.

~~36~~18. The composition of any one of claims ~~31~~13-~~35~~17, wherein the composition comprises a DNA recombinase, zinc finger nuclease, or transcription activator-like nuclease.

~~37. The composition of claim 36, wherein the DNA recombinase is Cre recombinase.~~

~~38. The composition of any one of claims 31-37, wherein the composition comprises a zinc finger nuclease.~~

~~39. The composition of any one of claims 31-38, wherein the composition comprises a transcription activator-like effector nuclease.~~

19. The composition of claims 13-17, wherein the composition comprises a nucleic acid.

20. The composition of claim 19, wherein the nucleic acid is an siRNA, microRNA, interfering RNA, dsRNA, mRNA, DNA vector, ribozyme, antisense polynucleotide, or DNA expression cassette encoding an siRNA, microRNA, dsRNA, ribozymes or antisense nucleic acid.

21. The composition of claim 19, wherein the composition comprises an siRNA.

~~40~~22. The composition of any one of claims ~~31-39~~13-21, wherein the composition comprises a nanoparticle comprising the polymer of any of claims 1-20 and the nucleic acid or polypeptide.

~~41~~23. The composition of any one of claims ~~31-40~~13-22, wherein the composition comprises a second polymer that comprises polyethylene oxide.

~~42~~24. A method of delivering a nucleic acid and/or polypeptide to a cell *in vitro*, the method comprising administering the composition of any one of claims ~~31-41~~13-23 to the cell.

25. Use of a composition of any of claims 13-23 for preparing a medicament for delivering a nucleic acid and/or polypeptide to a cell in a subject.

~~43. The method of claim 42, wherein the cell is in a subject and the composition of any one of claims 30-40 is administered to the subject.~~

~~44. The method of claim 42 or 43, wherein the polymer comprises a tissue-specific targeting moiety that localizes the polymer to tissues of the peripheral nervous system, the central nervous system, liver, muscle, lung, bone, or the eye of the subject.~~

~~45. The method of claim 44, wherein the polymer comprises a targeting moiety that preferentially binds to tumor cells.~~

~~46. The method of any of claims 42-45, wherein the composition comprises one or more of an RNA-guided endonuclease or nucleic acid encoding same, a guide nucleic acid, and a donor nucleic acid, and the composition facilitates editing of a target gene in the cell.~~

~~47. The method of any of claims 42-46, wherein the cell is in a host, optionally a human, and the composition is delivered to the cell by administering the composition to the host.~~