R_2 and R_3 are independently optionally substituted hetero-C_{1-10}-alkyl, wherein one or more chain carbon atoms is optionally replaced by a heteroatom;

R_{2a} and R_{3a} are independently optionally substituted hetero-C_{1-10}-alkyl, wherein one or more chain carbon atoms is optionally replaced by a heteroatom;

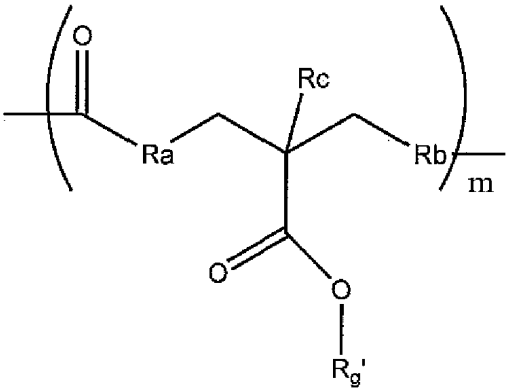
R_{2b} comprises an anchoring moiety, wherein the anchoring moiety comprises an α-β-unsaturated carbonyl group;

R_{3b} comprises an antibacterial moiety;

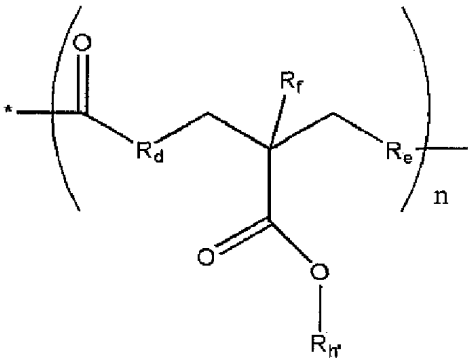
m is an integer in the range of 2 to 20; and

n is an integer in the range of 0 to 100.

In the present disclosure, there is provided a method of synthesizing a copolymer comprising monomer units represented by formulas (IIIA) and/or (IIIB):



Formula (IIIA)



Formula (IIIb)

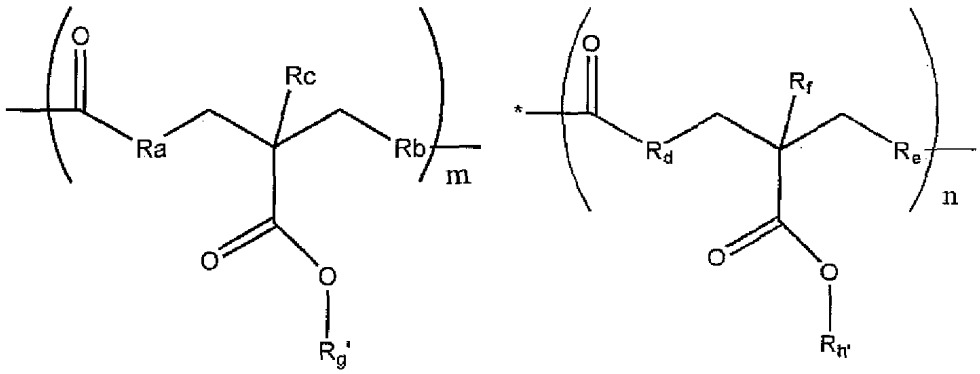
wherein the copolymer is terminated on one end by R_1 and on the other end by R_4;

R_1 is a polymer residue comprising an antifouling moiety;

R_4 is H, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocycle, or optionally substituted heterocarbocycle;

thereby forming a copolymer comprising monomer units of Formula (IIIA) and/or (IIIB).

In a second aspect of the present disclosure, there is provided a method of synthesizing a copolymer comprising monomer units represented by formulas (IIIA) and (IIIB):



Formula (IIIA) Formula (IIIb)

wherein the copolymer is terminated on one end by R_1 and on the other end by R_4;

R_1 is a polymer residue comprising an antifouling moiety;

R_4 is H, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocycle, or optionally substituted heterocarbocycle;

R_a, R_b, R_c, R_d, R_e and R_f are independently $C(R_5)_2$, O or $N(R_5)$;

R_5 is H, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocycle, or optionally substituted heterocarbocycle;

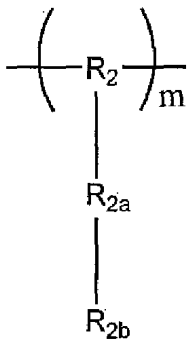
R_g' represents protected R_g, and R_h' represents aryl or heteroaryl substituted with at least one substituent capable of being quaternized,

wherein R_g comprises an anchoring moiety wherein the anchoring moiety comprises an α-β-unsaturated carbonyl group;

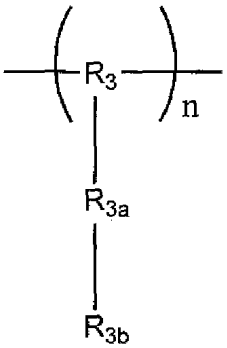
m is an integer in the range of 2 to 20; and

Claims

1. A copolymer comprising monomer units represented by formulas (I) and (II):



Formula (I)



Formula (II)

wherein the copolymer is terminated on one end by R_1 and on the other end by R_4;

R_1 comprises an antifouling moiety;

R_4 is H, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocycle, or optionally substituted heterocarbocycle;

R_2 and R_3 are independently optionally substituted hetero-C_{1-10}-alkyl, wherein one or more chain carbon atoms is optionally replaced by a heteroatom;

R_{2a} and R_{3a} are independently optionally substituted hetero-C_{1-10}-alkyl, wherein one or more chain carbon atoms is optionally replaced by a heteroatom;

R_{2b} comprises an anchoring moiety, wherein the anchoring moiety comprises an α-β-unsaturated carbonyl group;

R_{3b} comprises an antibacterial moiety;

m is an integer in the range of 2 to 20; and

n is an integer in the range of 0 to 100.

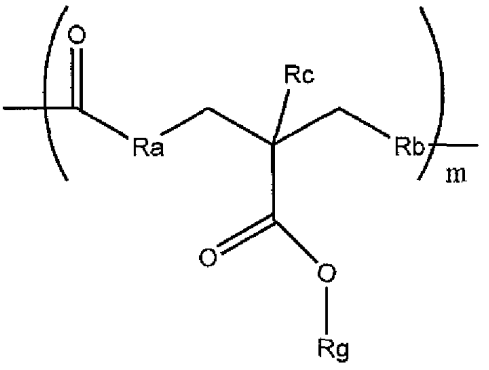
about 2,400 or
about 10,000.

6. The copolymer according to any one of claims 1 to 5, wherein

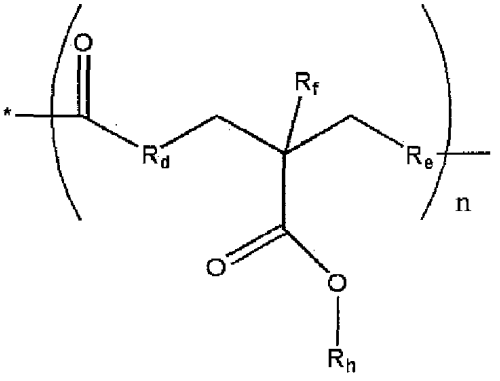
the anchoring moiety is selected from the group consisting of maleic acid, maleamic acid and maleimide groups; and wherein the antibacterial moiety comprises a cation; or

the antibacterial moiety comprises a quaternary ammonium.

7. The copolymer according to any one of claims 1 to 6, wherein Formula (I) is of Formula (IA) and Formula (II) is of Formula (IIA):



Formula (IA)



Formula (IIA)

wherein m and n are as defined in claim 1;

R_a, R_b, R_c, R_d, R_e and R_f are independently $C(R_5)_2$, O or $N(R_5)$;

R_5 is H, optionally substituted alkyl, optionally substituted alkenyl, optionally substituted alkynyl, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocycle, or optionally substituted heterocarbocycle;

R_g comprises an anchoring moiety, wherein the anchoring moiety comprises an α-β-unsaturated carbonyl group; and

R_h comprises an antibacterial moiety.

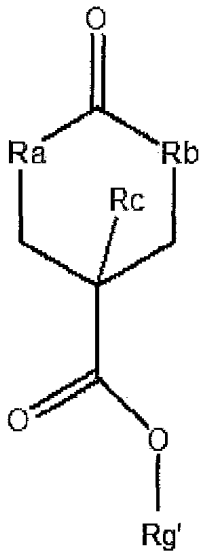
wherein R_g comprises an anchoring moiety, wherein the anchoring moiety comprises an α-β-unsaturated carbonyl group;

m is an integer in the range of 2 to 20; and

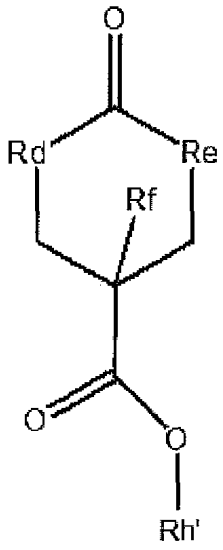
n is an integer in the range of 0 to 100,

the method comprising the step of:

(i) performing a ring-opening polymerization reaction in a reaction mixture comprising compounds of Formula (IC), H-R_i, and compounds of Formula (IIC):



Formula (IC)



Formula (IIC)

with the proviso that compounds of Formula (IIC) are present only when n≠0,

thereby forming a copolymer comprising monomer units of Formula (IIIA) and/or (IIIB).

14. The method of claim 13, wherein the copolymer is selected from the group consisting of: