CLAIMS

1. A macroscopic implant comprising a surface comprising a polyether polymer, polyester polymer, polysulfone polymer, polydimethylsiloxane polymer, or a polytetrafluoroethylene polymer, in which the surface is modified with a moiety of structure -X-R_1;

in which

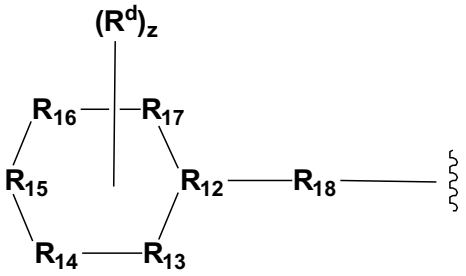
X is oxygen, sulfur, or NR_2, in which R_2 is hydrogen, alkyl, or substituted alkyl; and

R_1 has the structure

$$–\mathbf{A}–\mathbf{B}(–\mathbf{C})_\delta,$$

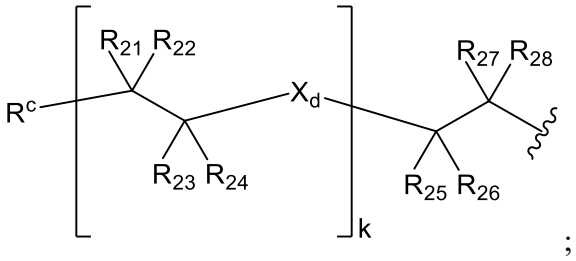
Formula XII

in which **A** is



Formula VI

in which R^{18} in **A** is -$(CR_{19}R_{19})_p$-; p is an integer from 0 to 5; each R_{19} is hydrogen; each R^d is independently alkyl, alkenyl, alkynyl, substituted alkyl, substituted alkenyl, substituted alkynyl, alkoxy, alkylamino, dialkylamino, hydroxy, aryl, substituted aryl, heteroaryl, substituted heteroaryl, substituted alkoxy, carboxyl, substituted carboxyl, amino, substituted amino, amido, substituted amido, C_3-C_{20} cyclic, substituted C_3-C_{20} cyclic, heterocyclic, or substituted heterocyclic; z is an integer from 0 to 11; R_{12}, R_{13}, R_{14}, R_{15}, R_{16}, and R_{17} in A, are independently C or N, in which the bonds between adjacent R_{12} to R_{17} are double or single according to valency, and in which R_{12} to R_{17} are bound to none, one, or two hydrogens according to valency; or



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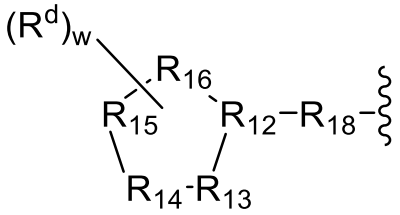
Formula VIII

in which R_{21}, R_{22}, R_{23}, R_{24}, R_{25}, R_{26}, R_{27}, and R_{28} in **A** are independently hydrogen, alkyl, substituted alkyl, alkenyl, substituted alkenyl, alkynyl, substituted alkynyl, aryl, substituted aryl, heteroaryl, substituted heteroaryl, arylalkyl, substituted arylalkyl, alkoxy, substituted alkoxy, aroxy, substituted aroxy, carbonyl, substituted carbonyl, carboxyl, substituted carboxyl, amino, substituted amino, amido, substituted amido, C_3-C_{20} cyclic, substituted C_3-C_{20} cyclic, heterocyclic, substituted heterocyclic, poly(ethylene glycol), or poly(lactic-co-glycolic acid); k is an integer from 0 to 20; each X_d is independently absent, O, or S; and R^c is **B**;

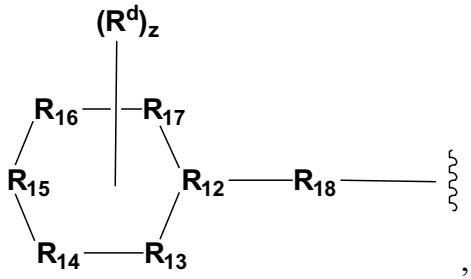
in which **B** is



Formula IX

in which R^{18} in **B** is -$(CR_{19}R_{19})_p$-; p is an integer from 0 to 5; each R_{19} is hydrogen; each R^d is independently alkyl, alkenyl, alkynyl, substituted alkyl, substituted alkenyl, substituted alkynyl, alkoxy, alkylamino, dialkylamino, hydroxy, aryl, substituted aryl, heteroaryl, substituted heteroaryl, substituted alkoxy, carboxyl, substituted carboxyl, amino, substituted amino, amido, substituted amido, C_3-C_{20} cyclic, substituted C_3-C_{20} cyclic, heterocyclic, or substituted heterocyclic; w is an integer from 0 to 4; each R_{12}, R_{13}, R_{14}, R_{15}, and R_{16} in B, are independently C or N, in which the bonds between adjacent R_{12} to R_{16} are double or single according to valency, and in which R_{12} to R_{16} are bound to none, one, or two hydrogens according to valency;

in which **C** is



, alkyl, carbonyl, or substituted alkyl;

Formula VI

in which R^{18} in **C** is $-(CR_{19}R_{19})_p-$ or $-(CR_{19}R_{19})_p-X_b-(CR_{19}R_{19})_q-$, in which p and q are independently integers from 0 to 5; X_b is absent, -O-, -S-, -S(O)-, $-S(O)_2-$, or NR_{20}; each R_{19} is hydrogen; R_{20} is alkyl or substituted alkyl; each R^d is independently alkyl, alkenyl, alkynyl, substituted alkyl, substituted alkenyl, substituted alkynyl, alkoxy, alkylamino, dialkylamino, hydroxy, aryl, substituted aryl, heteroaryl, substituted heteroaryl, substituted alkoxy, carboxyl, substituted carboxyl, amino, substituted amino, amido, substituted amido, C_3-C_{20} cyclic, substituted C_3-C_{20} cyclic, heterocyclic, or substituted heterocyclic; z is an integer from 0 to 11; in which R_{12}, R_{13}, R_{14}, R_{15}, R_{16}, and R_{17} in C, are independently C, O, N, S, S(O), or $S(O)_2$, in which the bonds between adjacent R_{12} to R_{17} are double or single according to valency, and in which R_{12} to R_{17} are bound to none, one, or two hydrogens according to valency;

in which δ is 1; and

in which substituted means substituted with one or more substituents independently selected from: alkyl, alkenyl, alkynyl, aryl, heteroaryl, halo, hydroxy, alkoxy, aroxy, alkylthio, arylthio, cyano, isocyano, carbonyl, carboxyl, amino, amido, sulfonyl, sulfonic acid, phosphoryl, phosphonyl, polyaryl, C_3-C_{20} cyclic, heterocyclic, amino acid, peptide, and polypeptide groups.

2. A macroscopic implant according to Claim 1, which contains biological material.

3. A macroscopic implant according to Claim 2, in which the biological material comprises cells.

4. A macroscopic implant according to Claim 3, in which the cells are hormone-producing cells.

5. A macroscopic implant according to Claim 4, in which the hormone-producing cells comprise insulin-producing cells.

6. A macroscopic implant according to Claim 5, in which the insulin-producing cells comprise islet beta cells.

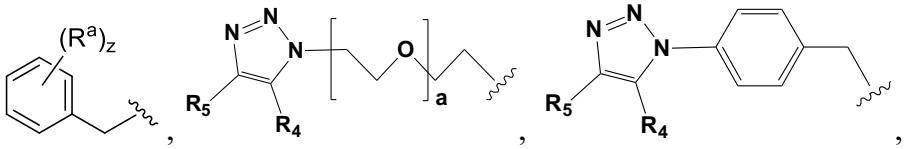
7. A macroscopic implant according to Claim 3, in which the cells are genetically engineered cells that secrete therapeutic agents.

8. A macroscopic implant according to any of Claims 3 to 7, in which the cells in the macroscopic implant are viable for at least 14 days after implantation.

9. A macroscopic implant according to any preceding claim, in which the macroscopic implant further comprises a pore size of between about 0.1 and about 1 μm.

10. A macroscopic implant according to any preceding claim, in which:

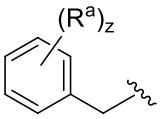
R_1 is, independently in one or more sites of chemical modification,



R_4, and R_5, are, independently, hydrogen, methyl, or -CH_2-OH or **C**;

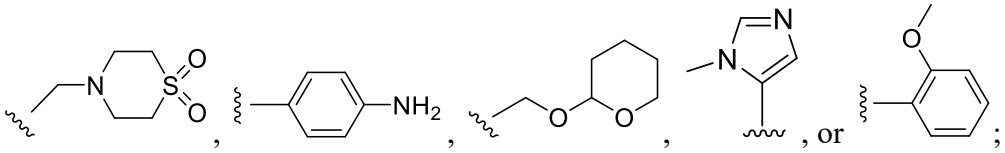
R^a is alkylamino, dialkylamino, hydroxy, substituted alkyl, alkenyl, substituted alkenyl, alkynyl, substituted alkynyl, aryl, substituted aryl, heteroaryl, substituted heteroaryl, alkoxy, substituted alkoxy, aroxy, substituted aroxy, alkylthio, substituted alkylthio, arylthio, substituted arylthio, carbonyl, substituted carbonyl, carboxyl, substituted carboxyl, amino, substituted amino, amido, substituted amido, polyaryl, substituted polyaryl, C_3-C_{20} cyclic, substituted C_3-C_{20} cyclic, heterocyclic, substituted heterocyclic, amino acid, poly(ethylene glycol), peptide, polypeptide group, arylalkyl substituted arylalkyl, sulfonyl, substituted sulfonyl, sulfonic acid, phosphoryl, substituted phosphoryl, phosphonyl, and substituted phosphonyl, or poly(lactic-co-glycolic acid);

in which for the moiety



, the surface contains R^a;

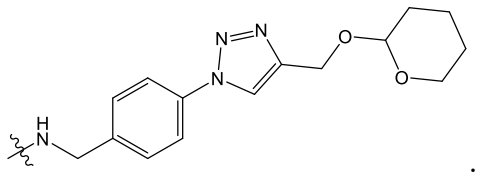
in which, **C** is methyl, -$COCH_3$, -CH_2-$N(CH_2$-$CH_3)_2$,



a is an integer between 1 and 30, inclusive; and

z is an integer between 0 and 5, inclusive.

11. A macroscopic implant according to any preceding claim, in which the moiety comprises:



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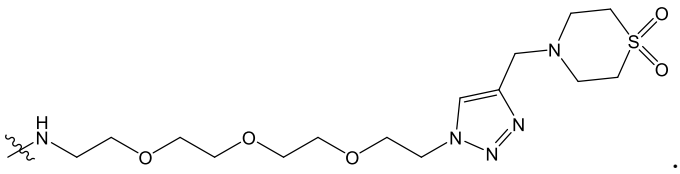
12. A macroscopic implant according to any of Claims 1 to 10, in which the moiety comprises:



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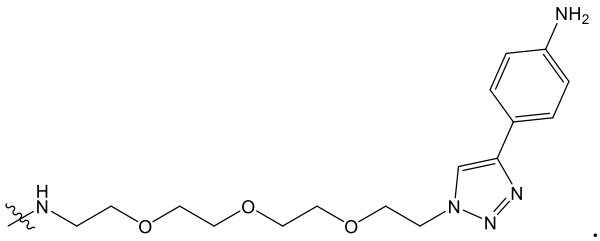
13. A macroscopic implant according to any of Claims 1 to 10, in which the moiety comprises:



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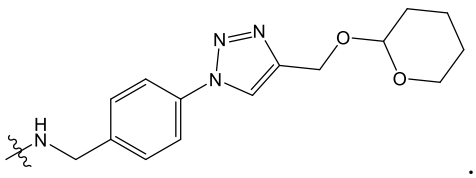
14. A macroscopic implant according to any preceding claim, in which the surface is an exterior surface.

15. A macroscopic implant according to any Claims 1 to 13, in which the surface is an interior surface.

16. A macroscopic implant according to any preceding claim, in which the moiety is covalently attached to the surface.

17. A macroscopic implant according to Claim 16, in which the surface is an exterior surface and the moiety comprises



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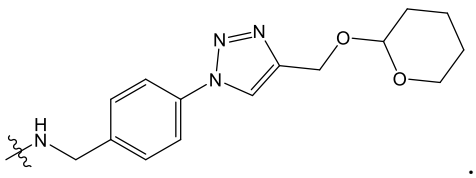
18. A macroscopic implant according to Claim 16, in which the surface is an interior surface and the moiety comprises



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19. A macroscopic implant according to any of Claims 3 to 18, in which the cells encapsulated in a polymer.

20. A macroscopic implant comprising:

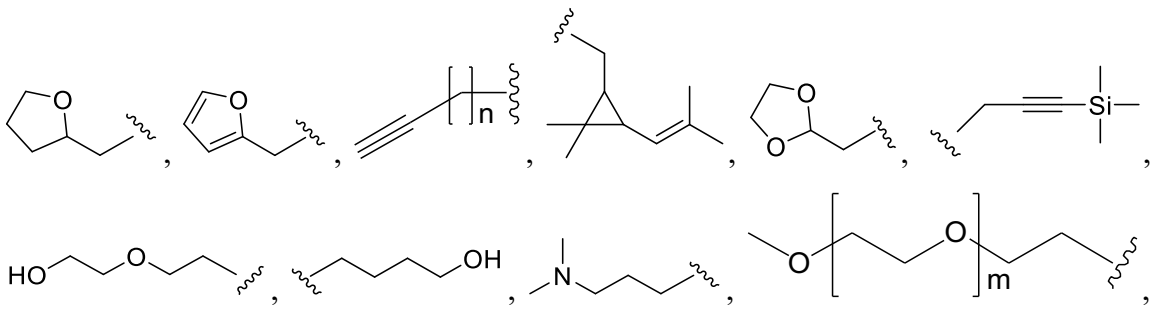
(a) a surface comprising a polyether polymer, polyester polymer, polysulfone polymer, polydimethylsiloxane polymer, or a polytetrafluoroethylene polymer, in which the surface is modified with a moiety of structure -X-R_1; and

(b) an insulin-producing cell,

in which

X is oxygen, sulfur, or NR_2, in which R_2 is hydrogen, alkyl, or substituted alkyl; and

R_1 is, independently in one or more sites of chemical modification,



in which, n is an integer between 1 and 12, inclusive; and m is an integer between 3 and 16, inclusive.

21. A macroscopic implant according to Claim 20, which contains biological material.

22. A macroscopic implant according to Claim 21, in which the biological material comprises cells.

23. A macroscopic implant according to any preceding claim, in which the macroscopic implant is a cardiac pacemaker, a catheter, a needle injection catheter, a blood clot filter, a vascular transplant, a balloon, a stent transplant, a biliary stent, an intestinal stent, a bronchial stent, an esophageal stent, a ureteral stent, an aneurysm-filling coil or other coil device, a surgical repair mesh, a transmyocardial revascularization device, a percutaneous myocardial revascularization device, a prosthesis, an organ, a vessel, an aorta, a heart valve, a tube, an organ replacement part, a fiber, a hollow fiber, a membrane, a textile, a blood container, a titer plate, an adsorber media, a dialyzer, a connecting piece, a sensor, a valve, an endoscope, a filter, a pump chamber, or another medical device intended to have hemocompatible properties.

24. A macroscopic implant according to any preceding claim, in which when X = NR_2 or S, and A = Formula VIII, R^d in Formula IX is not a peptide.