Claims

1. A process for the manufacture of a solid object having a surface comprising a layered coating of cationic and anionic polymer wherein the outer coating layer comprises an anticoagulant entity, comprising the steps of:
   i) treating a surface of the solid object with a cationic polymer;
   ii) treating the surface with an anionic polymer;
   iii) optionally repeating steps i) and ii) one or more times;
   iv) treating the surface with a cationic polymer; and
   v) treating the outermost layer of cationic polymer with an anticoagulant entity, thereby to covalently attach the anticoagulant entity to the outermost layer of cationic polymer;

   wherein,
   the anionic polymer is characterized by having (a) a total molecular weight of 650 kDa-10,000 kDa; and (b) a solution charge density of >4 μeq/g;
   wherein,
   step ii) is carried out at a salt concentration of 0.25 M-5.0 M;
   wherein the anionic polymer is a polymer comprising $-SO_3^-$ groups;
   and wherein the sulfur content of the anionic polymer is between 10% and 25% by weight of the anionic polymer.

2. A process for the manufacture of a solid object according to claim 1, wherein the anionic polymer is dextran sulfate.

3. A process for the manufacture of a solid object according to claim 1 or claim 2, wherein the anionic polymer is characterized by having a total molecular weight of 750 kDa-10,000 kDa, such as 1,000 kDa-10,000 kDa.

4. A process for the manufacture of a solid object according to any one of claims 1 to 3, wherein step ii) is carried out at a salt concentration of 0.25 M-4.0 M, such as 0.25 M-3.0 M.

5. A process for the manufacture of a solid object according to claim any one of claims 1 to 4, wherein the salt is selected from the group consisting of sodium chloride, sodium sulfate, sodium hydrogen phosphate and sodium phosphate.

6. A process for the manufacture of a solid object according to claim 5, wherein the salt is sodium chloride.

7. A process for the manufacture of a solid object according to any one of claims 1 to 6, wherein the cationic polymer of step i) is a polyamine, which is optionally cross-linked.

8. A process for the manufacture of a solid object according to any one of claims 1 to 7, wherein the cationic polymer of step iv) is a polyamine, which is optionally cross-linked.

9. A process for the manufacture of a solid object according to any one of claims 1 to 8, wherein the anticoagulant entity is a heparin moiety.

10. A process for the manufacture of a solid object according to claim 9, wherein the heparin moiety is an end-point attached heparin moiety.

11. A process for the manufacture of a solid object according to claim 10, wherein the end-point attached heparin moiety is connected through its reducing end.

12. A process for the manufacture of a solid object according to any one of claims 1 to 11, wherein the anionic polymer is a polymer comprising groups selected from $-CO_2^-$, $-PO_3H^-$ and $-PO_3^{2-}$.

13. A process for the manufacture of a solid object according to any one of claims 1 to 12, wherein the sulfur content of the anionic polymer is between 15% and 20% by weight of the anionic polymer.

14. A process for the manufacture of a solid object having a surface comprising a layered coating of cationic and anionic polymer wherein the outer coating layer comprises an anticoagulant entity, comprising the steps of:
    i) treating a surface of the solid object with a cationic polymer;
    ii) treating the surface with an anionic polymer;
    iii) optionally repeating steps i) and ii) one or more times;
    iv) treating the surface with a cationic polymer; and
    v) treating the outermost layer of cationic polymer with an anticoagulant entity, thereby to covalently attach the anticoagulant entity to the outermost layer of cationic polymer;

    wherein,
    the anionic polymer is a polymer comprising $-SO_3^-$ groups,
    the anionic polymer is characterized by having (a) a total molecular weight of 650 kDa-10,000 kDa; and (b) a sulfur content between 10% and 25% by weight of the anionic polymer;
    and wherein,
    step ii) is carried out at a salt concentration of 0.25 M-5.0 M.

15. A process for the manufacture of a solid object having a surface comprising a layered coating of cationic and anionic polymer wherein the outer coating layer comprises an anticoagulant entity, comprising the steps of:
    i) treating a surface of the solid object with a cationic polymer;
    ii) treating the surface with an anionic polymer;
    iii) optionally repeating steps i) and ii) one or more times;
    iv) treating the surface with a cationic polymer; and

v) treating the outermost layer of cationic polymer with an anticoagulant entity, thereby to covalently attach the anticoagulant entity to the outermost layer of cationic polymer;

wherein,
the anionic polymer is characterized by having a total molecular weight of 650 kDa-10,000 kDa;
the anionic polymer is dextran sulfate;
and wherein,
step ii) is carried out at a salt concentration of 0.25 M-5.0 M.

16. A process for the manufacture of a solid object according to either claim 14 or 15, wherein the anticoagulant entity is a heparin moiety.

17. A solid object having a surface comprising a layered coating of cationic and anionic polymer, wherein the outer coating layer is a layer comprising cationic polymer to which is covalently bound an anticoagulant entity;
wherein the anionic polymer is characterized by having (a) a total molecular weight of 650 kDa-10,000 kDa; and (b) a solution charge density of >4 μeq/g;
wherein the anionic polymer is a polymer comprising $-SO_3^-$ groups
and wherein the sulfur content of the anionic polymer is between 10% and 25% by weight of the anionic polymer.

18. A solid object according to claim 17, wherein the anionic polymer is characterized by having a total molecular weight of 650 kDa-1,000 kDa, 1,000 kDa-4,500kDa, 4,500 kDa-7,000 kDA or 7,000 kDa-10,000 kDa.

19. A solid object according to claim 17 or 18, wherein the anionic polymer is applied to the surface at a salt concentration of 0.25 M-5.0 M, such as 0.25 M-4.0 M or 0.25 M-3.0 M.

20. A solid object according to claim 19, wherein the anionic polymer is a polymer comprising groups selected from $-CO_2^-$, $-PO_3H^-$ and $-PO_3^{2-}$.

21. A solid object according to claim 20, wherein the sulfur content of the anionic polymer is between 15% and 20% by weight of the anionic polymer.

22. A solid object having a surface comprising a layered coating of cationic and anionic polymer, wherein the outer coating layer is a layer comprising cationic polymer to which is covalently bound an anticoagulant entity; the anionic polymer is a polymer comprising $-SO_3^-$ groups and wherein the anionic polymer is characterized by having (a) a total molecular weight of 650 kDa-10,000 kDa; and (b) a sulfur content between 10% and 25% by weight of the anionic polymer.

23. A process for the manufacture of a solid object having a surface comprising a layered coating of cationic and anionic polymer wherein the outer coating layer is a layer comprising cationic polymer, comprising the steps of:
    i) treating a surface of the solid object with a cationic polymer;
    ii) treating the surface with an anionic polymer;
    iii) optionally repeating steps i) and ii) one or more times; and
    iv) treating the surface with a cationic polymer;
    wherein,
    the anionic polymer is a polymer comprising $-SO_3^-$ groups,
    the anionic polymer is characterized by having (a) a total molecular weight of 650 kDa-10,000 kDa; and (b) a sulfur content between 10% and 25% by weight of the anionic polymer;
    and wherein,
    step ii) is carried out at a salt concentration of 0.25 M-5.0 M.

24. A process for the manufacture of a solid object having a surface comprising a layered coating of cationic and anionic polymer wherein the outer coating layer is a layer comprising cationic polymer, comprising the steps of:
    i) treating a surface of the solid object with a cationic polymer;
    ii) treating the surface with an anionic polymer;
    iii) optionally repeating steps i) and ii) one or more times; and
    iv) treating the surface with a cationic polymer;
    wherein,
    the anionic polymer is characterized by having a total molecular weight of 650 kDa-10,000 kDa;
    the anionic polymer is dextran sulfate;
    and wherein,
    step ii) is carried out at a salt concentration of 0.25 M-5.0 M.

25. A solid object having a surface comprising a layered coating of cationic and anionic polymer, wherein the outer coating layer is a layer comprising cationic polymer; the anionic polymer is a polymer comprising $-SO_3^-$ groups and wherein the anionic polymer is characterized by having (a) a total molecular weight of 650 kDa-10,000 kDa; and (b) a sulfur content between 10% and 25% by weight of the anionic polymer.

26. A process for the manufacture of a solid object having a surface comprising a layered coating of cationic and anionic polymer wherein the outer coating layer is a layer comprising anionic polymer, comprising the steps of:
    i) treating a surface of the solid object with a cationic polymer;
    ii) treating the surface with an anionic polymer;
    iii) optionally repeating steps i) and ii) one or more times;
    wherein,
    the anionic polymer is a polymer comprising $-SO_3^-$ groups,

the anionic polymer is characterized by having (a) a total molecular weight of 650 kDa-10,000 kDa; and (b) a sulfur content between 10% and 25% by weight of the anionic polymer;
and wherein,
step ii) is carried out at a salt concentration of 0.25 M-5.0 M.

27. A process for the manufacture of a solid object having a surface comprising a layered coating of cationic and anionic polymer wherein the outer coating layer is a layer comprising anionic polymer, comprising the steps of:
i) treating a surface of the solid object with a cationic polymer;
ii) treating the surface with an anionic polymer;
iii) optionally repeating steps i) and ii) one or more times;
wherein,
the anionic polymer is characterized by having a total molecular weight of 650 kDa-10,000 kDa;
the anionic polymer is dextran sulfate;
and wherein,
step ii) is carried out at a salt concentration of 0.25 M-5.0 M.

28. A solid object having a surface comprising a layered coating of cationic and anionic polymer, wherein the outer coating layer is a layer comprising anionic polymer; the anionic polymer is a polymer comprising $-SO_3^-$ groups and wherein the anionic polymer is characterized by having (a) a total molecular weight of 650 kDa-10,000 kDa; and (b) a sulfur content between 10% and 25% by weight of the anionic polymer.