

CLAIMS

1. A composition comprising:
 - (i) a first polymer;
 - (ii) a second branched polymer;
 - (iii) a third polymer having reactivity to the second polymer and is at least partially crosslinked to the second branched polymer;wherein any one of the second and the third polymer comprises a tissue-adhesive group.
2. The composition of claim 1, wherein an average molecular weight of said first polymer ranges from 10 KDa to 900 KDa.
3. The composition of any one of claims 1 and 2, wherein said first polymer is selected from the group consisting of: a polyester, a polyanhydride, a polyacetal, a polyorthoester, a polyurethane, a polycarbonate, a polyphosphazene, a polyphosphoester, a polyether, a silicone, a polyamide, a polysulfone, a polyether ether ketone (PEEK), poly(ethylene glycol), polytetrafluoroethylene, polyethylene, a polysaccharide or any combination or a copolymer thereof.
4. The composition of any one of claims 1 to 3, wherein said third polymer is branched.
5. The composition of any one of claims 1 to 4, wherein said third polymer comprises a nucleophilic group.
6. The composition of any one of claims 1 to 5, wherein said crosslinked is by reacting the tissue-adhesive group and said nucleophilic group.
7. The composition of any one of claims 1 to 6, wherein said branched is selected from the group consisting of: a star polymer, a dendrimer, and a hyperbranched polymer or any combination thereof.
8. The composition of any one of claims 1 to 7, wherein said branched comprises three to ten arms.
9. The composition of any one of claims 1 to 8, wherein said tissue-adhesive group is selected from the group consisting of: an activated ester (e.g. thio-ester, a peno-oroalkyl ester, a pento-orophenol ester, a N-hydroxysuccinimide ester), an acyl halide, a chloroformate, an anhydride, an aldehyde, an epoxide, an isocyanate, an isothiocyanate, a maleimide, a carbonate, a sulfonyl chloride, a haloacetamide, an acyl azide, an imidoester, a carbodiimide, a vinyl sulfone, ortho-pyridyl-disulfide, or any combination thereof.

10. The composition of any one of claims 1 to 9, wherein said tissue-adhesive group is covalently bound to an arm of said second polymer.
11. The composition of any one of claims 1 to 10, wherein said second branched polymer, said third polymer, or both are selected from the group consisting of: polyethers, polyesters, polydioxanones, polyphosphoesters, polyurethanes, and polyamides or any combination or a co-polymer thereof.
12. The composition of any one of claims 1 to 11, wherein said second branched polymer, said third polymer, or both comprise polyethyleneglycol; and wherein said first polymer is selected from the group consisting of: polylactic acid, poly(L-lactic acid), poly(D-lactic acid), polyglycolic acid, poly(L-glycolic acid), poly(D-glycolic acid), nylon and polycaprolactone or any combination or a co-polymer thereof.
13. The composition of any one of claims 1 to 12, wherein an average molecular weight of said second branched polymer, and of said third polymer ranges from 500 Da to 100000 Da.
14. The composition of any one of claims 1 to 13, wherein the weight ratio of said third polymer to said second polymer ranges from 1:1 to 1:10.
15. The composition of claim 1, wherein the weight ratio of said first polymer to said second polymer ranges from 1:1 to 20:1.
16. The composition of any one of claims 1 to 15, wherein (i) said first polymer, and (ii) at least one of said second branched polymer and said third polymer are blended together, so as to form a blended polymeric fiber.
17. The composition of any one of claims 1 to 16, wherein said blended polymeric fiber is biodegradable.
18. The composition of any one of claims 1 to 17, wherein said blended polymeric fiber is characterized by an average fiber diameter of 0.5 to 10 μm .
19. The composition of claim 1, wherein said blended polymeric fiber is characterized by a melting point of 50 to 150°C.
20. A matrix, comprising a tissue adhesive layer, wherein said tissue adhesive layer comprises a blended polymeric fiber of any one of claims 16 to 19.
21. The matrix of claim 20, further comprising an additional layer of polymeric fibers.
22. The matrix of any one of claims 20 and 21, wherein said additional layer enhances a stability of said tissue-adhesive layer.

23. The matrix of any one of claims 20 to 22, wherein said tissue-adhesive layer is characterized by a pore size of 0.5 to 100 μm .
24. The matrix of any one of claims 20 to 23, wherein said tissue-adhesive layer is characterized by a tensile strength of at least 0.05 MPa.
25. The matrix of any one of claims 20 to 24, wherein said tissue-adhesive layer is characterized by an adhesion strength of 1 to 10 N, wherein said adhesion strength is measured according to a shear test.
26. The matrix of any one of claims 20 to 25, wherein said tissue-adhesive layer is characterized by a porosity of at least 60 %.
27. The matrix of any one of claims 20 to 26, wherein said tissue-adhesive layer is characterized by a thickness of 0.5 to 250 μm .
28. The matrix of any one of claims 20 to 27, wherein said tissue-adhesive layer is characterized by a water-permeability of less than 1 ml per hour per cm^2 upon exposure to an aqueous liquid at a pressure of 40 mmHg.
29. The matrix of any one of claims 20 to 28, further comprising a pharmaceutically active ingredient.
30. The matrix of any one of claims 20 to 29, for use in promoting (i) bioadhesion of at least one biological tissue; (ii) blood coagulation.
31. The matrix of any one of claims 20 to 30, for use in repairing and/or substituting a biological tissue.
32. A kit comprising (i) a blended polymeric fiber comprises a first polymer and a second polymer; and (ii) a composition comprising a third polymer having reactivity to the second polymer; wherein the second polymer and the third polymer comprise respectively the second branched polymer or the third polymer of any one of claims 1 to 19.
33. The kit of claim 32, wherein said first polymer is selected from the group comprising: a polyester, a polyanhydride, a polyacetal, a polyorthoester, a polyurethane, a polycarbonate, a polyphosphazene, a polyphosphoester, a polyether, a silicone, a polyamide, a polysulfone, a polyether ether ketone (PEEK), poly(ethylene glycol), polytetrafluoroethylene, polyethylene, a polysaccharide or a combination or a copolymer thereof.
34. The kit of any one of claims 32 to 33, wherein said second polymer, said third polymer, or both comprise polyethyleneglycol; and wherein said first polymer is selected from the group consisting of: polylactic acid, poly(L-lactic acid), poly(D-lactic

acid), polyglycolic acid, poly(L-glycolic acid), poly(D-glycolic acid), nylon and polycaprolactone or any combination or a co-polymer thereof.

35. The kit of any one of claims 32 to 34, wherein said blended polymeric fiber in contact with said additional component results in a tissue-adhesive layer.

36. The kit of any one of claims 32 to 35, wherein the weight ratio of said third polymer to said second polymer ranges from 1:1 to 1:20.

37. The kit of any one of claims 32 to 36, wherein the weight ratio of said first polymer to said second polymer ranges from 1:1 to 20:1.

38. A process for manufacturing the composition of any one of claims 1 to 19 or the blended polymeric fiber of the kit of any one of claims 32 to 37, comprising: (i) mixing a first polymer and at least one of the second branched polymer and the third polymer with a solvent, thereby obtaining a solution; and (ii) providing said solution into an electrospinning apparatus.

39. The process of claim 38, wherein said process is for manufacturing a layer of polymeric fibers.