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and modifications which fall within the true spirit and scope of the invention.

What is claimed is:

1. A hydrogel system for forming a medical implant in situ in a human body, the hydrogel system comprising:

a first component that forms physical crosslinks to make a water-insoluble gel in situ immediately upon introduction into the human body, and

a second component that forms chemical crosslinks in situ,

wherein the physical crosslinks formed by the first component stabilize and confine the second component in situ during formation of the chemical crosslinks;

with the first component including a first polymer that is chosen from the group consisting of a thermoreversible polymer, a hydrophobic thermoreversible polymer, a pH responsive polymer, a composition of polymers with opposite ionic charges, a composition of a poly (alkylene) oxide plus a second polymer that undergoes an association reaction with the poly(alkylene) oxide, a thixotropic polymer, a polymer that gels upon cooling, and a polymer that forms physical crosslinks in response to a divalent cation;

with the second component including a second polymer that includes chemical groups for forming covalent bonds; and

the second component being a substantially water soluble macromer.

2. The hydrogel system of claim 1 wherein the second component forms chemical crosslink by a mechanism selected from a group consisting of free radical polymerization, condensation polymerization, anionic or cationic polymerization, and step growth polymerization.

3. The hydrogel system of claim 1 wherein the first component also forms chemical crosslinks by a mechanism selected from a group consisting of free radical polymerization, condensation polymerization, anionic or cationic polymerization, and step growth polymerization.

4. The hydrogel system of claim 1 wherein the macromer comprises a water soluble crosslinking agent.

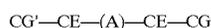
5. The hydrogel system of claim 4 wherein the water soluble crosslinking agent is self condensible.

6. The hydrogel system of claim 1 wherein the second component comprises a water soluble crosslinkable polymer.

7. The hydrogel system of claim 1 wherein the stability and reactivity of the first and second components is a function of the pHs of the first and second components.

8. The hydrogel system of claim 1 wherein the implant is biodegradable.

9. The hydrogel system of claim 1 wherein at least one of the components has the structure:



wherein,

(A) is a di or multifunctional substantially water soluble polymeric backbone;

CG and CG' are active crossing or leaving group portions; and

(—CE—) is an optional chain extending segment.

10. The hydrogel system of claim 9 wherein the reactive functional groups CG and CG' are different.

11. The hydrogel system of claim 9 wherein at least one optional chain extending segment CE is interposed between two chemical crosslinks and is degradable.

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12. The hydrogel system of claim 11 wherein the chemical groups are chosen from the group consisting of chemical groups that undergo free radical polymerization, condensation polymerization, anionic polymerization, cationic polymerization, and step growth polymerization, or

chosen from the group consisting of electrophilic and nucleophilic chemical groups.

13. A system for forming a medical implant in a human body in situ comprising:

a first component and a second component that cooperate in situ; comprising:

the first component including a substantially water soluble precursor that forms a mechanically stable water-insoluble gel in situ stabilized by physical crosslinks;

with the first component being a first polymer chosen from the group consisting of a thermoreversible polymer, a hydrophobic thermoreversible polymer, a pH responsive polymer, a composition of polymers with opposite ionic charges, a composition of a poly (alkylene) oxide and a polymer that undergoes an association reaction with the poly(alkylene) oxide, a thixotropic polymer, a polymer that gels upon cooling, and a polymer that forms physical crosslinks in response to a divalent cation;

with the second component being a second polymer including chemical groups for forming covalent bonds wherein the chemical groups include N-hydroxy succinamide esters.

14. The system of claim 13 wherein the chemical groups are chosen from the group consisting of chemical groups that undergo free radical polymerization, condensation polymerization anionic polymerization, cationic polymerization, and step growth polymerization.

15. The system of claim 13 wherein the chemical groups are chosen from the group consisting of electrophilic and nucleophilic chemical groups.

16. The system of claim 13 wherein the first component is a thermoreversible polymer.

17. The system of claim 13 wherein the first component comprises poly(oxyethylene)-poly(oxypropylene) block copolymer and the second component comprises N-hydroxy succinamide ester on the second polymer that is covalently linkable by the N-hydroxy succinamide ester to a third polymer having at least one nucleophilic group.

18. The system of claim 13 further comprising at least one color indicator substance.

19. The system of claim 18 wherein the color indicator substance is chosen from the group consisting of phenol red, thymol blue, furoxone, rivanol, or picric acid.

20. The system of claim 18 wherein the color indicator substance is blue, yellow, or green.

21. The system of claim 18 wherein the color indicator substance is a first color when the system is stored and a second color when the system is disposed in situ.

22. A hydrogel system for forming a medical implant in situ in a human body, the hydrogel system comprising:

a first component comprising a polymer that is chosen from the group consisting of a thermoreversible polymer and a polymer that forms physical crosslinks in response to a divalent cation; and

a second component that forms chemical crosslinks in situ, with the second component being a substantially water soluble macromer and comprising N-hydroxy succinamide ester chemical groups for forming covalent bonds with nucleophiles.

23. The hydrogel system of claim 22 wherein the implant is biodegradable.