CLAIMS

1. A self-assembled multiblock crosslinked polymer material comprising at least two polymer chains, wherein each chain has distinct blocks at least one of which is a poly(4-vinylpyridine) and wherein the material self assembles into at least a bulk layer having a thickness of 2 microns to 500 microns and a surface layer having a thickness of 5 nm to 500 nm;

wherein the bulk layer comprises at least macropores having a size of 200 nm to 100 microns;

wherein the surface layer comprises at least mesopores having a size of 1 nm to 200 nm;

wherein at least a portion of one or both of the macropores and mesorpores are isoporous;

wherein at least a portion of at least one poly(4-vinylpyridine) block is crosslinked to at least one different poly(4-vinylpyridine) block on at least one of said at least two polymer chains; and

wherein the crosslinking provides chemical resistance and the thickness of the bulk layer provides mechanical integrity to the polymer material upon exposure to solvent conditions selected from the group consisting of acidic solvents, basic solvents, organic solvents, and a combination thereof.

2. The material of claim 1, wherein the material is one of asymmetric or symmetric.

3. The material of claim 1 or 2, wherein the material further comprises a porous support onto which the material is self-assembled.

4. The material of any one of claims 1-3, wherein the at least two polymer chains comprise poly(isoprene)-b- (styrene)-b-(4-vinylpyridine) (ISV).

5. The material of any one of claims 1-4, wherein both the macropores of the bulk layer and the mespores of the surface layer are crosslinked.

6. The material of any one of claims 1-5, wherein the at least one poly(4-vinylpyridine) block has been crosslinked to the at least one different poly(4-vinylpyridine) block via a multifunctional crosslinking agent reacting with multiple amine units.

7. The material of any one of claims 1-5, wherein the at least one poly(4-vinylpyridine) block has been crosslinked to the at least one different poly(4-vinylpyridine) block via a multifunctional crosslinking agent comprising both a reactive thiol unit and a reactive halide unit or comprising both a reactive α,β-unsaturated carbonyl and a reactive halide unit.

8. The material of any one of claims 1-5, wherein the at least one poly(4-vinylpyridine) block has been crosslinked to the at least one different poly(4-vinylpyridine) block by a saturated or unsaturated carbon-containing chain of 1 to 12 carbon atoms.

9. The material of any one of claims 1-8, wherein the material is used as a separation media, or as a fabric with desirable protective properties.

10. The material of any one of claims 1-8, wherein the crosslinked material exhibits increased resistance to temperature or harsh media compared to the uncrosslinked material.

11. A method of preparing a self-assembled multi block crosslinked polymer material, comprising:

a. forming an isoporous structure with both macropores and mesopores from a multi block copolymer material, wherein the multi block copolymer material comprising at least two polymer chains, wherein each chain has distinct blocks at least one of which is a poly(4-vinylpyridine) wherein the multi block copolymer material self assembles into at least a bulk layer having a thickness of 2 microns to 500 microns and a surface layer having a thickness of 5 nm to 500 nm, wherein the bulk layer comprises at least macropores having a size of 200 nm to 100 microns, wherein the surface layer comprises at least mesopores having a size of 1 nm to 200 nm, and wherein at least a portion of one or both of the macropores and mesorpores are isoporous; and

b. crosslinking at least a portion of at least one poly(4-vinylpyridine) block with a chemical reaction;

wherein the crosslinking provides chemical resistance and the thickness of the bulk layer provides mechanical integrity to the polymer material upon exposure to solvent conditions selected from the group consisting of acidic solvents, basic solvents, organic solvents, and a combination thereof.

12. The method of claim 11 wherein the isoporous material is formed by:

a. dissolution of multi block polymer and optionally crosslinking agent, in at least one chemical solvent

b. dispensing polymer solution onto a substrate or mold, or through a die or template

c. removal of at least a portion of chemical solvent

d. exposure to a nonsolvent causing precipitation of at least a portion of the polymer

e. crosslinking reaction.

13. The method of claim 12, wherein the steps to form the isoporous material further comprise:

d-i. a wash step.

14. The method of claim 12 or 13, wherein the steps to form the isoporous material further comprise:

d-ii: exposure to a crosslinking agent.

15. The method of any one of claims 11-14, wherein the crosslinking agent comprises a multifunctional crosslinking agent capable of reacting with multiple amine units, optionally a photoinitiator which generates radicals upon UV radiation exposure.

16. The method of any one of claims 11-14, wherein the crosslinking agent comprises a multifunctional crosslinking agent comprising both a reactive thiol unit and a reactive halide unit or comprising both a reactive α,β-unsaturated carbonyl and a reactive halide unit.

17. The method of any one of claims 11-14, wherein the crosslinking agent comprises a multifunctional halide compound with two or more reactive halide groups selected from bromine, chlorine, or iodine, and at least a portion of at least one polymer block comprises a crosslinkable polymer unit comprising at least one reactive amine.

18. The method of any one of claims 11-14, wherein the crosslinking agent comprises a multifunctional α,β-unsaturated carbonyl compound with two or more reactive α,β-unsaturated

carbonyl units, and at least a portion of at least one polymer block comprising a crosslinkable polymer unit comprises at least one reactive amine.

19. The method of any one of claims 11-14, wherein the crosslinking agent comprises a halide and α,β-unsaturated carbonyl compound with two or more reactive groups comprising at least one α,β-unsaturated carbonyl unit and at least one halide, and at least a portion of at least one polymer block comprising a crosslinkable polymer unit comprising at least one reactive amine.

20. The method of any one of claims 11-19, wherein the multiblock copolymer material in step (a) is self assembled onto a porous support.

21. The method of any one of claims 11-20, wherein the multiblock copolymer material comprises poly(isoprene)-b- (styrene)-b-(4-vinylpyridine) (ISV).

22. The method of any one of claims 11-21, wherein the crosslinking in step (b) comprises crosslinking both the macropores of the bulk layer and the mespores of the surface layer.
23. A process separating or detecting an analyte of interest contacting a medium containing the analyte of interest with a material of any one of claims 1-8.

24. A device comprising the material of any one of claims 1-8.

25. The device of claim 24, wherein the device is selected from a pleated pack, flat sheets in a crossflow cassette, a spiral wound module, hollow fiber, a hollow fiber module, or a sensor.