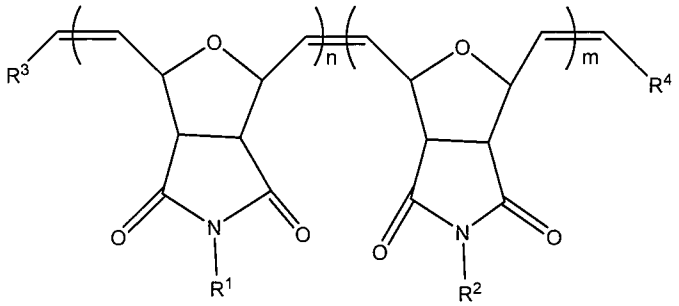
CLAIMS:

1. A method of preparing a porous membrane comprising a diblock copolymer of the formula (I):



(I),

wherein:

R^1 is a C_{10}-C_{18} alkyl group optionally substituted with a substituent selected from halo, alkoxy, alkylcarbonyl, alkoxycarbonyl, amido, and nitro, or a C_3-C_{11} cycloalkyl group, optionally substituted with a substituent selected from alkyl, halo, alkoxy, alkylcarbonyl, alkoxycarbonyl, amido, and nitro;

R^2 is a C_6-C_{20} aryl group or a heteroaryl group, optionally substituted with a substituent selected from hydroxy, amino, halo, alkoxy, alkylcarbonyl, alkoxycarbonyl, amido, and nitro;

one of R^3 and R^4 is a C_6-C_{14} aryl group, optionally substituted with a substituent selected from hydroxy, halo, amino, and nitro, and the other of R^3 and R^4 is a C_1-C_{22} alkoxy group, optionally substituted with a substituent selected from carboxy, amino, mercapto, alkynyl, alkenyl, halo, azido, and heterocyclyl; and

n and m are independently about 10 to about 2000;

the method comprising:

(i) dissolving the diblock copolymer in a solvent system to obtain a polymer solution;

(ii) spin coating the polymer solution onto a substrate;

(iii) annealing the coating obtained in (ii) to obtain a self-assembled structure or a porous membrane;

(iv) soaking the self-assembled structure obtained in (iii) in a solvent or mixture of solvents to obtain a porous membrane; and optionally

(v) washing the porous membrane obtained in (iii) or (iv).

2. The method of claim 1, wherein R^2 is a phenyl group, optionally substituted with a substituent selected from hydroxy, amino, halo, alkoxy, alkylcarbonyl, alkoxycarbonyl, amido, and nitro.

3. The method of claim 1 or 2, wherein R^3 is phenyl.

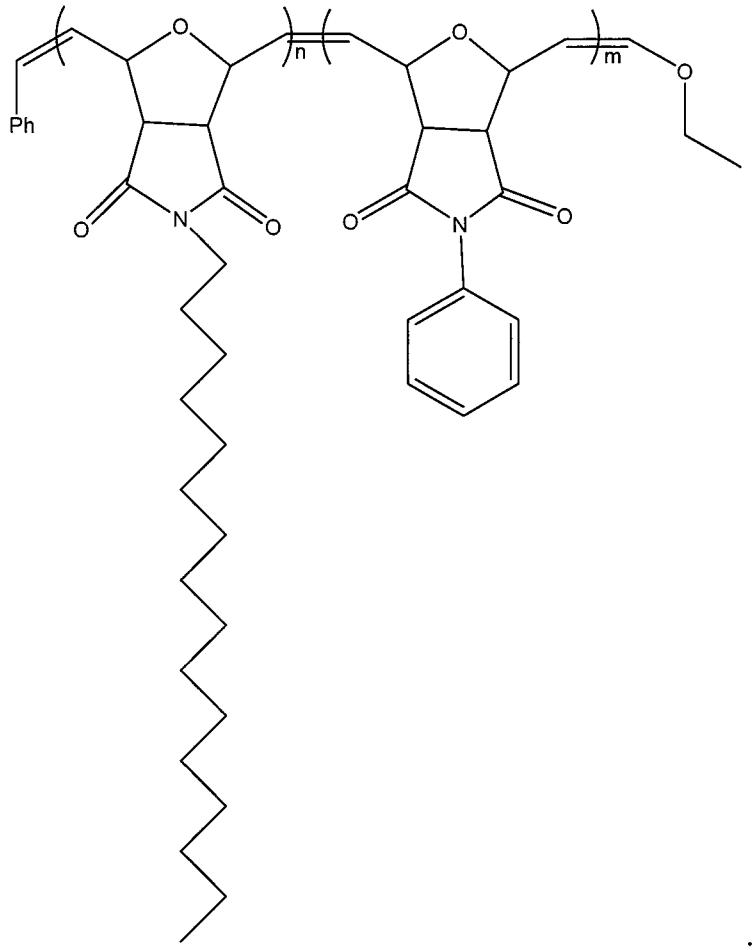
4. The method of any one of claims 1-3, wherein R^4 is a C_1-C_6 alkoxy group.

5. The method of any one of claims 1-4, wherein n is about 10 to about 200 and m is about 50 to about 2000.

6. The method of any one of claims 1-5, wherein n is about 83 to about 190 and m is about 675 to about 1525.

7. The method of any one of claims 1-6, wherein n is about 105 and m is about 870.

8. The method of any one of claims 1-7, wherein the diblock copolymer of formula (I) has the following structure:



9. The method of any one of claims 1-8, wherein the solvent system includes a solvent or a mixture of solvents selected from halogenated hydrocarbons, ethers, amides, and sulfoxides.

10. The method of any one of claims 1-9, wherein the solvent system includes a solvent or a mixture of solvents selected from dichloromethane, 1-chloropentane, 1,1-dichloroethane, dimethylformamide, dimethylacetamide, N-methylpyrrolidone, dimethylsulfoxide, tetrahydrofuran, 1,3-dioxane, and 1,4-dioxane.

11. The method of any one of claims 1-10, wherein the polymer solution contains about 0.1 to about 2% by weight of the diblock copolymer.

12. The method of any one of claims 1-11, wherein the substrate is selected from glass, silicon wafer, metal plate, plastic film, and a plastic film coated on a glass substrate or on or a silicon wafer.

13. The method of any one of claims 1-12, wherein the substrate is porous.

14. The method of any one of claims 1-13, wherein the annealing is carried out in the presence of a solvent vapor comprising dichloromethane.

15. The method of any one of claims 1-14, wherein the annealing is carried out twice.

16. The method of any one of claims 1-15, wherein the diblock copolymer in the resulting membrane has a cylindrical morphology perpendicular to the plane of the membrane and the membrane has pores whose diameters are in the range of about 40 to 60 nm and the pores extend all the way down to the film thickness and to a depth of about 50 nm.