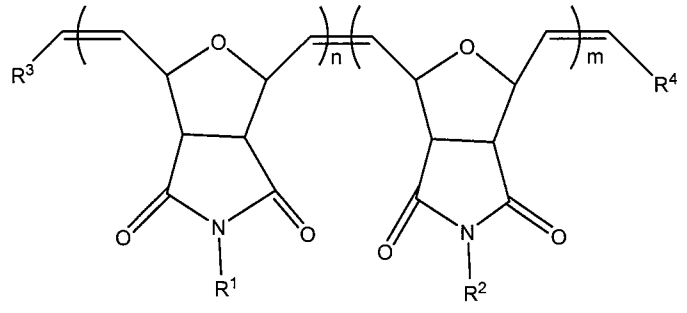
CLAIMS:

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) spray coating the polymer solution onto a substrate; and

(iii) annealing the coating obtained in (ii) in a vapor comprising a solvent or a mixture of solvents to obtain a self-assembled structure.

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.

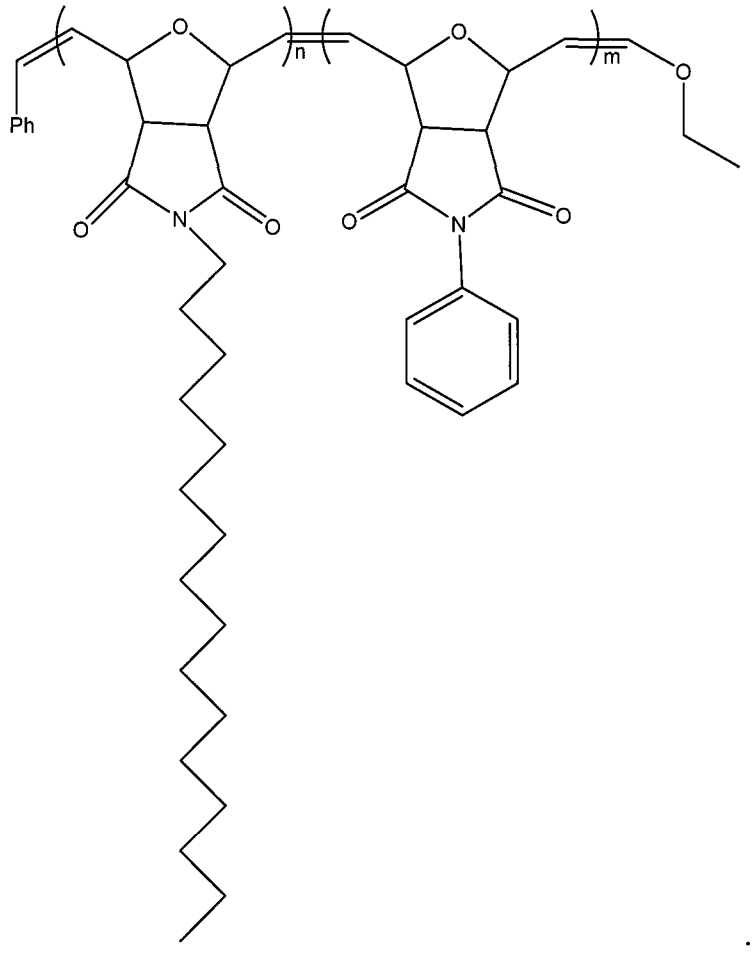
4. The method of any one of claims 1-3, wherein R^4 is a C_1-C_6 alkoxy group.

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, chloroform, 1,1-dichloroethane, N,N-dimethylformamide, N,N-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 3 to about 8% 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, woven or nonwoven fabric, 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 1-11, which results in a single layer membrane.

17. The method of any one of claims 1-15, which results in a composite membrane comprising a first layer and a second layer, the first layer comprising the diblock copolymer and ordered pores in a cylindrical morphology and the second layer comprising a microporous support layer.