CLAIMS

1. A method for separating a metal from a metal-containing liquid stream, the liquid stream being acidic, basic or organic solvent-based, the method comprising steps of : providing a nanofiltration (NF) membrane comprising a matrix formed from:

    i. at least one di-, tri- or tetra-halo substituted diazine or triazine-containing monomer, oligomer or polymer, and

    ii. at least one multifunctional amine having a molecular weight in the range of 400 to 750,000, provided that at least one of the di-, tri- or tetra-halo substituted diazine or triazine-containing monomer, oligomer or polymer is not a di- or triazine monomer which is substituted only by chloro;

2. The method of claim 1, wherein said providing NF membrane comprising a matrix that is covalently bound to an underlying ultrafiltration (UF) support membrane.

3. The method of claim 1, wherein said NF membrane, after exposing to 75% sulfuric acid at 60^0C for 300 hours, said nanofiltration membrane removes at least 70% of the copper ions at a flux greater than 1 gfd from a feed solution of 8.5% $CuSO_4$ in 20% sulfuric acid when the feed solution is applied to the membrane at a feed pressure of 600 psig and a temperature of 25°C;

4. The method of claim 1, wherein said NF membrane, after exposing of said NF membrane to 20% sulfuric acid at 90^0C for 180 hours, said NF membrane removes at least 70% of the copper ions at a flux greater than 1 gfd from a feed solution of 8.5% $CuSO_4$ in 20% sulfuric acid when the feed solution is applied to the membrane at a feed pressure of 600 psig and a temperature of $25^{0.}$

5. The method of claim 1, wherein said NF membrane, after exposing to 20% sulfuric acid at 45^0C for 60 days, the nanofiltration membrane removes at least 70% of the copper ions at a flux greater than 1 gfd from a feed solution of 8.5% $CuSO_4$ in 20% sulfuric acid when the feed solution is applied to the membrane at a feed pressure of 600 psig and a temperature of 25^0C; and permeating at least a portion of said metal-containing liquid

stream through said nanofiltration membrane, whereby to obtain a permeate which is reduced in the metal relative to the metal-containing liquid stream.

6. The method of claim 1, wherein said liquid stream is selected from the group consisting of an acidic metal-containing liquid stream, basic metal-containing liquid stream, organic solvent-based or metal-containing liquid stream.

7. The method of any of claims 1 to 6, wherein said metal is copper.

8. The method of claim 1, wherein said matrix is covalently bound to an underlying ultrafiltration (UF) or microfiltration(MF) membrane.

9. The method of claim 8, wherein said underlying membrane is preferably a UF membrane that is covalently attached to a non- woven support material.

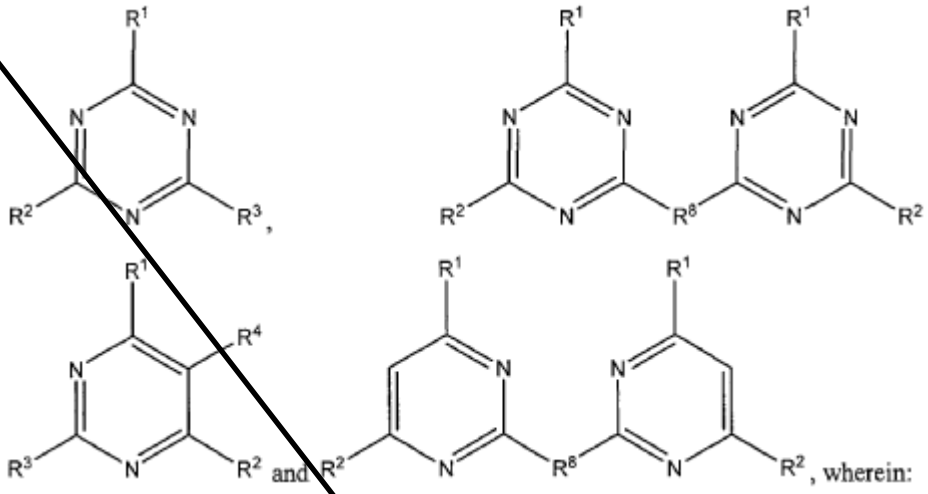
10. The method of claim 1, wherein after said exposing, the flux under the recited conditions is at least 6 gfd.

11. The method of any of claims 3 to 5, wherein , after further exposing of said NF membrane to 75% sulfuric acid at 60^0C for 1000 hours, said NF membrane exhibiting a glucose rejection of at least 95% at a flux of at least 10 gfd.

12. The method of any of claims 3 to 5, wherein after said exposing, at least 80% of the metal is removed under the conditions recited.

13. The method of any of claims 3 to 5, wherein after said exposing, at least 90% of the metal is removed under the conditions recited.

14. The method of claim 1, wherein said diazine or triazine-containing monomer or oligomer is selected from the group consisting of:



R^1 is independently selected at each occurrence from bromo, chloro, iodo, fluoro, -NHR^5, -OR^5 and SR^5, wherein R^5 is is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl;

R^2 is independently selected at each occurrence from bromo, chloro and fluoro;

R^3 is independently selected at each occurrence from bromo, chloro, fluoro,

-NHR^5, -OR^5 and SR^5, wherein R^5 is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl;

R^4 is selected from H, bromo, chloro, fluoro, -NHR^5, -OR^5 and SR^5, wherein R^5 is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl; and

R is independently at each occurrence -NH-A-NH-, wherein A is selected from C_{1-20} aliphatic moieties, C_{6-10} aromatic moieties, and combinations thereof; provided that at at least two occurrences, R^1, R^2, R^3 and R^4, taken together, are selected from bromo, chloro and fluoro, and further provided that when both R^1 and R^2 on a single ring are Cl, at least one of R^3 and R^4 is not Cl.

15. The method of claim 1, wherein said method additionally comprising steps of (a)providing an asymmetric base ultrafiltration membrane which at one face thereof has pores of smaller diameter than at the opposite face; (b)providing a solution containing at

least one di-, tri- or tetra-halo substituted diazine or triazine-containing monomer, oligomer or polymer, at least one multifunctional amine having a molecular weight in the range of 400 to 750,000, and optionally, at least one supplemental cross-linker; and (c)bringing said solution into contact with the face of the ultrafiltration membrane having smaller pores for a time sufficient to effect covalent bonding of the at least one di- or tri-halo substituted diazine or triazine-containing monomer, oligomer or polymer and the at least one multi-functional amine.

16. The method of claim 15 ,wherein prior to said contacting, said ultrafiltration membrane is modified by forming a cross-linked ultrafiltration skin on the surface thereof, on which the NF matrix is then formed.

17. The method of claim 15, wherein after said contacting, heating said ultrafiltration membrane.

18. The method of claim 15, wherein said multifunctional amine is selected from the group consisting of polyethylenemine, polyvinylamine, polyvinylanilines, polybenzylamines, polyvinylimidazolines, amine-modified polyepihalohydrins and any combination theerof.

19. The method of claim 15, wherein said supplemental cross-linker is selected from the group consisting of 2,4,6-trichloro-s-triazine, 4,6-dichloro-2-sodium p-sulfoanile-s-triazine (4,6-dichloro-2-p-anilinesulfonic acid sodium salt-s-triazine), 4,6-dichloro-2-diethanolamine-s-triazine and 4,6-dichloro-2-amino-s-triazine.

20. The method of claim 1, wherein said step of providing said matrix having a density of about 0.5 g per cm^3 to about 2.0 g per cm^3.

21. The method of claim 1, wherein said step of providing said matrix having a density of about 0.7 g/cm^3 to about 1.7 g/cm^3.

22. The method of claim 1,wherein said step of providing said matrix having a density of about 0.8 g/cm^3 to about 1.6 g/cm^3.

23. The method of claim 1, wherein said matrix is with a mass to area ratio of about 20 to about 200 mg/m^2.

24. The method of claim 1, wherein said matrix is with a mass to area ratio of about 30 to about 150 mg/m^2.

25. The method according to claim 1, wherein the method further comprises forming the acidic metal-containing liquid stream by providing a metal-containing ore and leaching metal from the ore by contacting the ore with sulfuric acid.

26. An apparatus for separating a metal from a metal-containing liquid stream, said liquid stream being acidic, basic or organic solvent-based, said apparatus comprising a nanofiltration (NF) membrane for which at least one of the following (a)(i) and (ii), (b), (c)(i), (c)(ii) and (c)(iii) is true:

    a. said NF membrane comprises a matrix that has been formed from (i)at least one di-, tri- or tetra-halo substituted diazine or triazine- containing monomer, oligomer or polymer, and

    (ii) at least one multifunctional amine having a molecular weight in the range of 400 to 750,000, provided that at least one of the di-, tri- or tetra- halo substituted diazine or triazine-containing monomer, oligomer or polymer is not a di- or triazine monomer which is substituted only by chloro;

    b. said NF membrane is a composite nanofiltration membrane which contains a matrix that is covalently bound to an underlying UF support membrane;

    c. (i) after exposure of said NF membrane to 75% sulfuric acid at $6O^0C$ for 300 hours, said NF membrane removes at least 70% of the copper ions at a flux greater than 1 gfd from a feed solution of 8.5% $CuSO_4$ in 20% sulfuric acid when the feed solution is applied to the membrane at a feed pressure of 600 psig and a temperature of 25^0C;

    (ii)after exposure of said NF membrane to 20% sulfuric acid at 90^0C for 180 hours, said NF membrane removes at least 70% of the copper ions at a flux greater than 1 gfd from a feed solution of 8.5% $CuSO_4$ in 20% sulfuric acid when

the feed solution is applied to the membrane at a feed pressure of 600 psig and a temperature of 25^0C;

(iii)after exposure of said NF membrane to 20% sulfuric acid at 45^0C for 60 days, said NF membrane removes at least 70% of the copper ions at a flux greater than 1 gfd from a feed solution of 8.5% $CuSO_4$ in 20% sulfuric acid when the feed solution is applied to the membrane at a feed pressure of 600 psig and a temperature of 25^0C;

27. The apparatus according to claim 26, wherein further comprising a housing which houses said NF membrane.

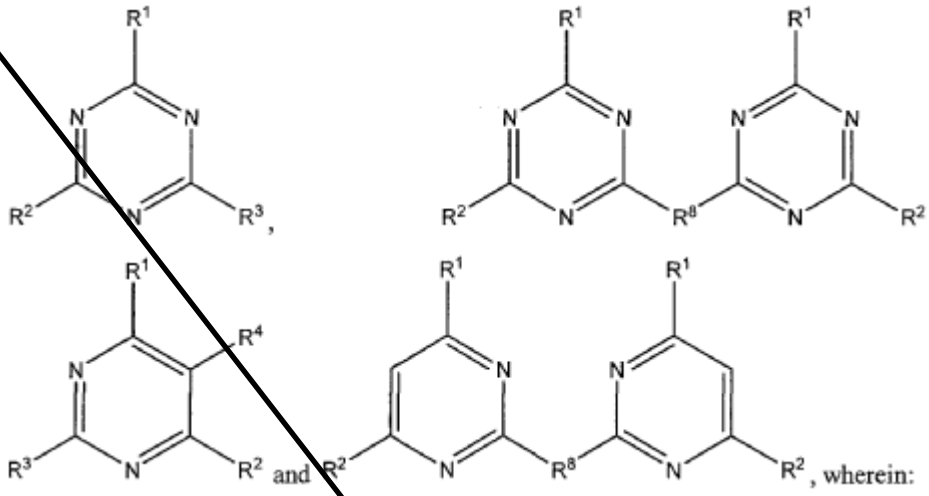
28. The apparatus according to claim 27, wherein said housing comprises at least one inlet port and at least one outlet port.

29. The apparatus according to claim 27, wherein said housing comprises at least two outlet ports which are separated such that one of said outlet ports is in fluid communication with a permeate stream that exits said NF membrane and the other of said outlet ports is in fluid communication with a retentate stream that is retained by said NF membrane..

30. The apparatus according to claim 27, wherein said matrix is covalently bound to an underlying ultrafiltration(UF) or microfiltration(MF) membrane.

31. The apparatus of claim 31, wherein said underlying membrane is a UF membrane that is covalently attached to a non-woven support material.

32. The apparatus according to claim 27, wherein said diazine or triazine-containing monomer or oligomer is selected from the group consisting of:



and , wherein:

R^1 is independently selected at each occurrence from bromo, chloro, iodo, fluoro, $-NHR^5$, $-OR^5$ and SR^5, wherein R^5 is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl;

R^2 is independently selected at each occurrence from bromo, chloro and fluoro; R^3 is independently selected at each occurrence from bromo, chloro, fluoro,

$-NHR^5$, $-OR^5$ and SR^5, wherein R^5 is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl;

R^4 is selected from H, bromo, chloro, fluoro, $-NHR^5$, $-OR^5$ and SR^5, wherein

R is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl; and

R^8 is independently at each occurrence -NH-A-NH-, wherein A is selected from C_{1-20} aliphatic moieties, C_{6-10} aromatic moieties, and combinations thereof; provided that at at least two occurrences, R^1, R^2, R^3 and R^4, taken together, are selected from bromo, chloro and fluoro, and further provided that when both R^1 and R^2 on a single ring are Cl, at least one of R and R^4 is not Cl.

33. The apparatus according to claim 26, wherein additionally comprises an asymmetric base ultrafiltration membrane which at one face thereof has pores of smaller diameter than at the opposite face; and a solution containing at least one di-, tri- or tetra-halo substituted

diazine or triazine-containing monomer, oligomer or polymer, at least one multifunctional amine having a molecular weight in the range of 400 to 750,000, and optionally, at least one supplemental cross-linker; said solution is brought into contact with the face of said ultrafiltration membrane having smaller pores under superatmospheric pressure for a time sufficient to effect covalent bonding of the at least one di- or tri-halo substituted diazine or triazine-containing monomer, oligomer or polymer and the at least one multi-functional amine.

34. The apparatus according to claim 33, wherein, prior to said contacting, said ultrafiltration membrane has been modified to facilitate covalent bonding to the surface thereof.

35. The apparatus of any of claims 33, wherein, prior to said contacting, the ultrafiltration membrane was modified by forming a cross-linked ultrafiltration skin on the surface thereof, on which the NF matrix is then formed.

36. The apparatus according to any of claims 33, wherein the formation of said nanofiltration membrane further comprises, after said contacting, heating the ultrafiltration membrane.

37. The apparatus according to any of claims 33, wherein said multifunctional amine is selected from the group consisting of polyethylenemine, polyvinylamine, polyvinylanilines, polybenzylamines, polyvinylimidazolines, and amine-modified polyepihalohydrins.

38. The apparatus according to any of claims 33, wherein said supplemental cross-linker is selected from the group consisting of 2,4,6-trichloro-s-triazine, 4,6-dichloro-2-sodium p-sulfoanile-s-triazine (4,6-dichloro-2-p-anilinesulfonic acid sodium salt-s-triazine), 4,6-dichloro-2-diethanolamine-s-triazine and 4,6-dichloro-2-amino-s-triazine.

39. The apparatus of claim 26, wherein said matrix has a density of from about 0.5 g per cm^3 to about 2.0 g per cm^3.

40. The apparatus of claim 26, wherein said matrix has a density of from about 0.7 g/cm^3 to about 1.7 g/cm^3.

41. The apparatus of claim 26, wherein said matrix has a density of from about 0.8 g/cm^3 to about 1.6 g/cm^3.

42. The apparatus of any of claims 26, wherein said matrix is with a mass to area ratio of about 20 to about 200 mg/m^2.

43. The apparatus of claim 26, wherein said matrix is with a mass to area ratio of about 30 to about 150 mg/m^2.

44. A nanofiltration (NF) membrane comprising a matrix that has been formed from:

i. at least one di-, tri- or tetra-halo substituted diazine or triazine- containing monomer, oligomer or polymer;

ii. at least one multifunctional amine having a molecular weight in the range of 400 to 750,000, provided that at least one of the di-, tri- or tetra- halo substituted diazine or triazine-containing monomer, oligomer or polymer is not a di- or triazine monomer which is substituted only by chloro;and

45. The NF membrane according to claim 44, wherein after exposure of said NF membrane to 75% sulfuric acid at 60^0C for 300 hours, said NF membrane removes at least 70% of the copper ions at a flux greater than 1 gfd from a feed solution of 8.5% $CuSO_4$ in 20% sulfuric acid when the feed solution is applied to the membrane at a feed pressure of 600 psig and a temperature of 25^0C;

46. The NF membrane according to claim 44, wherein after exposure of said matrix to 20% sulfuric acid at $9O^0$C for 180 hours, said matrix removes at least 70% of the copper ions at a flux greater than 1 gfd from a feed solution of 8.5% $CuSO_4$ in 20% sulfuric acid when the feed solution is applied to the membrane at a feed pressure of 600 psig and a temperature of 25^0C.

47. The NF membrane according to claim 44, wherein after exposure of said matrix to 20% sulfuric acid at 45°C for 60 days, said matrix removes at least 70% of the copper ions at a flux greater than 1 gfd from a feed solution of 8.5% $CuSO_4$ in 20% sulfuric acid when the

feed solution is applied to the membrane at a feed pressure of 600 psig and a temperature of 25^0C.

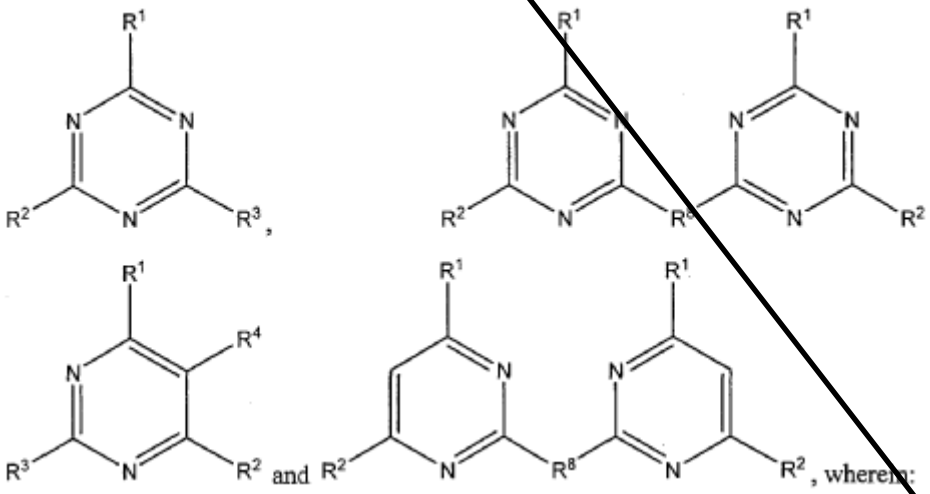
48. The NF membrane of claim 44, wherein said matrix is covalently bound to an underlying ultrafiltration or microfiltration membrane.

49. The NF membrane of claim 48, wherein said underlying membrane is a UF membrane that is covalently attached to a non-woven support material.

50. The NF membrane of any of claims 45 to 47, wherein after said exposure, the flux under the recited conditions is at least 6 gfd.

51. The NF membrane of any of claims 45 to 47, wherein after further exposure of the NF membrane to 75% sulfuric acid at 60^0C for 1000 hours, said NF membrane exhibits a glucose rejection of at least 95% at a flux of at least 10 gfd.

52. The NF membrane of claim 44, wherein said diazine or triazine-containing monomer or oligomer is selected from the group consisting of:



R^1 is independently selected at each occurrence from bromo, chloro, iodo, fluoro, $-NHR^5$, $-OR^5$ and SR^5, wherein R^5 is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl;

R is independently selected at each occurrence from bromo, chloro and fluoro;

R is independently selected at each occurrence from bromo, chloro, fluoro,

-NHR^5, -OR and SR , wherein R^5 is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl;

R^4 is selected from H, bromo, chloro, fluoro, -NHR^5, -OR^5 and SR^5, wherein

R^5 is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl; and

R is independently at each occurrence -NH-A-NH-, wherein A is selected from C_{1-20} aliphatic moieties, C_{6-10} aromatic moieties, and combinations thereof; provided that at at least two occurrences, R^1, R^2, R^3 and R^4, taken together, are selected from bromo, chloro and fluoro, and further provided that when both R^1 and R^2 on a single ring are Cl, at least one of R^3 and R^4 is not Cl.

53. The NF membrane of claim 44, wherein said matrix is formed by a process which comprises steps of (a)providing an asymmetric base ultrafiltration membrane which at one face thereof has pores of smaller diameter than at the opposite face; (b)providing a solution containing at least one di-, tri- or tetra-halo substituted diazine or triazine-containing monomer, oligomer or polymer, at least one multifunctional amine having a molecular weight in the range of 400 to 750,000, and optionally, at least one supplemental cross-linker; and (c)bringing the solution into contact with the face of the ultrafiltration membrane having smaller pores under superatmospheric pressure for a time sufficient to effect covalent bonding of the at least one di- or tri-halo substituted diazine or triazine-containing monomer, oligomer or polymer and the at least one multi-functional amine.

54. The NF membrane of claim 53, wherein prior to said contacting, said ultrafiltration membrane has been modified to facilitate covalent bonding to the surface thereof.

55. The NF membrane of claim 53, wherein, prior to said contacting, said ultrafiltration membrane was modified by forming a cross-linked ultrafiltration skin on the surface thereof, on which the NF matrix is then formed.

56. The NF membrane of any of claims 53, wherein the formation of said matrix further comprises, after said contacting, heating said ultrafiltration membrane.

57. The NF membrane of any of claims 53, wherein said multifunctional amine is selected from the group consisting of polyethylenemine, polyvinylamine, polyvinylanilines, polybenzylamines, polyvinylimidazolines, amine-modified polyepihalohydrins and a combination thereof .

58. The NF membrane of claim 53, wherein said supplemental cross-linker is selected from the group consisting of 2,4,6-trichloro-s-triazine, 4,6-dichloro-2-sodium p-sulfoanile-s-triazine (4,6-dichloro-2-p-anilinesulfonic acid sodium salt-s-triazine), 4,6-dichloro-2-diethanolamine-s-triazine and 4,6-dichloro-2-amino-s-triazine.

59. The NF membrane of claim 44, wherein said matrix has a density of from about 0.5g per cm^3 to about 2.0g per cm^3.

60. The NF membrane of claim 44, wherein said matrix has a density of from about 0.7 g/cm^3 to about 1.7 g/cm^3 .

61. The NF membrane of claim 44, wherein said matrix has a density of from about 0.8 g/cm^3 to about 1.6 g/cm^3 .

62. The NF membrane of any of claims 44, wherein said matrix is with a mass to area ratio of about 20 to about 200 mg/m^2.

63. The NF membrane of claim 44, wherein said matrix is with a mass to area ratio of about 30 to about 150 mg/m^2 .

CLAIMS

1. A polymeric semipermeable membrane comprising a non-cross-linked base polymer having reactive pendant moieties, said base polymer being modified by forming a cross-linked skin onto a surface thereof, said skin being formed by a cross-linking reaction of reactive pendant moieties on said surface with a cross-linking oligomer or another polymer thereby, said base polymer is covalently bonded to said oligomer or another polymer; wherein said base polymer is polyacrylonitrile (PAN) such that at least one portion of said cross-linked skin of said base polymer is covalently bonded to a nanofiltration layer by immersion of said cross-linked skin of said base polymer in polyethylenimine (PEI) and condensate solution comprising cyanuric chloride and sulfanilic acid thereby, said polymeric semipermeable membrane having acid and organic solvent stability; said nanofiltration layer comprises (i) at least one di-, tri- or tetra-halo substituted diazine or triazine-containing monomer, oligomer or polymer, and (ii) at least one multifunctional amine having a molecular weight in the range of 400 to 750,000.

2. The polymeric semipermeable membrane according to claim 1, wherein additionally comprising a woven or non woven substrate underlying said base polymer.

3. The polymeric semipermeable membrane according to claim 1, wherein said base polymer is selected from polyacrylonitrile and copolymers thereof.

4. The polymeric semipermeable membrane according to claim 1, wherein said another polymer is selected from polyethylenimine and polyvinyl alcohol.

5. The polymeric semipermeable membrane according to claim 1, wherein said polymeric semipermeable membrane is an ultrafiltration membrane or a microfiltration membrane.

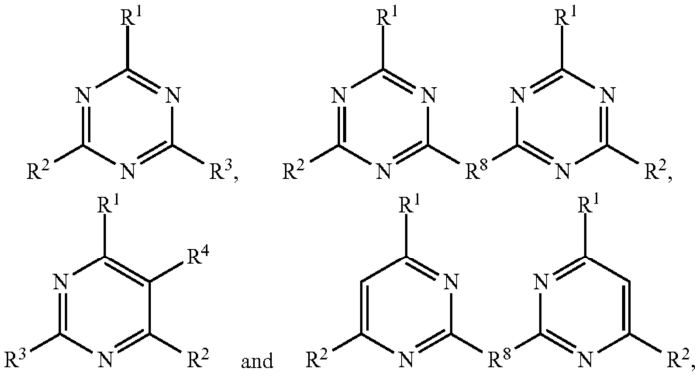
6. A nanofiltration (NF) membrane having stability in acid and organic solvents, said NF containing a matrix that has been formed from a solution comprising PEI and a condensate comprising cyanuric chloride and sulfanilic acid; said matrix was dried at elevated temperature thereby, forming a matrix comprising (i) at least one di-, tri- or tetra-halo substituted diazine or triazine-containing monomer, oligomer or polymer, and (ii) at least one multifunctional amine having a molecular weight in the range of 400 to 750,000.

7. The NF membrane of claim 6, wherein said matrix has been formed on an underlying ultrafiltration or microfiltration membrane.

8. The NF membrane of claim 7, wherein the underlying membrane is a modified ultrafiltration membrane by forming a cross-linked skin onto a surface thereof; said modified ultrafiltration is covalently attached to a support material.

9. The NF membrane of claim 8, wherein the support material is a non-woven support material.

10. The NF membrane of claim 6, wherein said diazine or triazine-containing monomer or oligomer is selected from the group consisting of:



wherein:

R^1 is independently selected at each occurrence from bromo, chloro, iodo, fluoro, $-NHR^5$, $-OR^5$ and SR^5, wherein R^5 is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl;

R^2 is independently selected at each occurrence from bromo, chloro and fluoro;

R^3 is independently selected at each occurrence from bromo, chloro, fluoro, $-NHR^5$, $-OR^5$ and SR^5, wherein R^5 is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl;

R^4 is selected from H, bromo, chloro, fluoro, $-NHR^5$, $-OR^5$ and SR^5, wherein R^5 is independently selected at each occurrence from H, optionally substituted alkyl and optionally substituted aryl; and

R^8 is independently at each occurrence -NH-A-NH-, wherein A is selected from C_{1-20} aliphatic moieties, C_{6-10} aromatic moieties, and combinations thereof; provided that at at

least two occurrences, R^1, R^2, R^3 and R^4, taken together, are selected from bromo, chloro and fluoro, and further provided that when both R^1 and R^2 on a single ring are Cl, at least one of R^3 and R^4 is not Cl.

11. The NF membrane of claim 6, wherein said multifunctional amine has a molecular weight of in the range of 400 to 250,000.

12. The NF membrane of claim 6, wherein said matrix is formed by a process which comprises providing an asymmetric base ultrafiltration membrane which at one face thereof has pores of smaller diameter than at the opposite face; providing a solution containing at least one di-, tri- or tetra-halo substituted diazine or triazine-containing monomer, oligomer or polymer, at least one multifunctional amine having a molecular weight in the range of 400 to 750,000; and bringing the solution into contact with the face of the ultrafiltration membrane having smaller pores under superatmospheric pressure for a time sufficient to effect covalent bonding of the at least one di- or tri-halo substituted diazine or triazine-containing monomer, oligomer or polymer and the at least one multi-functional amine.

13. The NF membrane of claim 12, wherein said solution further comprises at least one supplemental cross-linker.

14. The NF membrane of claim 12, wherein prior to said contacting, said ultrafiltration membrane has been modified to facilitate covalent bonding to the surface thereof.

15. The NF membrane of claim 12, wherein, prior to said contacting, the ultrafiltration membrane was modified by forming a cross-linked ultrafiltration skin on the surface thereof, on which the matrix is then formed.

16. The NF membrane of claim 12, wherein the formation of the matrix further comprises, after said contacting, heating said ultrafiltration membrane.

17. The NF membrane of claim 12, wherein said multifunctional amine is selected from the group consisting of polyethylenemine, polyvinylamine, polyvinylanilines, polybenzylamines, polyvinylimidazolines, and amine-modified polyepihalohydrins.

18. The NF membrane of claim 13, wherein said supplemental cross-linker is selected from the group consisting of 2,4,6-trichloro-s-triazine, 4,6-dichloro-2-sodium p-sulfoanile-s-triazine (4,6-dichloro-2-p-anilinesulfonic acid sodium salt-s-triazine), 4,6-dichloro-2-diethanolamine-s-triazine and 4,6-dichloro-2-amino-s-triazine.

19. The NF membrane of claim 6, wherein said matrix has a density of from about 0.5 g per cm^3 to about 2.0 g per cm^3.

20. The NF membrane of claim 6, wherein the mass to area ratio of said matrix is from about 20 to about 200 mg/m^2.

21. The polymeric semipermeable membrane according to claim 1, wherein said base polymer is preferably polyacrylonitrile.

22. The polymeric semipermeable membrane according to claim 1, characterized by having improved stability in an aggressive environment comprising at least one organic solvent.

23. The nanofiltration membrane according to claim 6, wherein after further exposure of said NF membrane to 75% sulfuric acid at 60ºC for 1000 hours, said NF membrane exhibits a glucose rejection of at least 95% at a flux of at least 10 gfd.

24. The nanofiltration membrane according to claim 6, wherein after further exposure of said NF membrane to 20% sulfuric acid solution at 90ºC for 180 hours, said membrane exhibits a glucose rejection of 98% at a flux of 950 liters/m*day.

25. A polymeric semipermeable membrane having solvents and acids stability, prepared by steps of:

    a. providing a UF base polymer comprising a cross linked polyacrylonitrile(PAN) containing active amino groups;

    b. providing a solution comprising polyethylenimine (PEI) and condensate; said condensate comprising cyanuric chloride and sulfanilic acid;

    c. immersing said PAN in said solution comprising PEI and condensate, thereby, covalently bonding a Nanofiltration (NF) layer with said UF base polymer ; said NF comprising (i) at least one di-, tri- or tetra-halo substituted diazine or triazine-containing monomer, oligomer or polymer, and (ii) at least one multifunctional amine having a molecular weight in the range of 400 to 750,000;

    d. curing said membrane by drying at elevated temperature.

26. The polymeric semipermeable membrane claim 25, wherein said elevated temperature is in the range of 50-100ºC.

27. The polymeric semipermeable membrane claim 25, wherein said polyethylenimine (PEI) solution has a concentration between 2%-10%.