Claims

What is claimed is:

1. A membrane comprising at least one strong acid functional group having a cationic counterion chosen from ammonium, C_1-C_6 alkylammonium, cyclohexylammonium, phosphonium, C_1-C_6 alkyl phosphonium, imidazolium, pyridinium, guanidinium, sulfonium, pyrrolidinium, morpholinium, and pyrimidinium.
2. The membrane of claim 1, wherein the cationic counterion is ammonium.
3. The membrane of claim 1 or 2, wherein the strong acid functional group is chosen from a sulfonic acid group, a phosphonic acid group, or a combination thereof.
4. The membrane of claim 1 or 2, wherein the strong acid functional group is a sulfonic acid group.
5. The membrane of any of claims 1 to 4, wherein contacting the membrane with a liquid composition comprising at least one ketone for seven days leads to the liquid composition having an increase in the sum of dimeric and oligomeric condensation species in the liquid composition in a range from greater than 0% to less than 100% as compared to the sum of dimeric and oligomeric condensation species in the liquid composition before it is contacted with the membrane.
6. The membrane of any of claims 1 to 5, wherein the membrane comprises a polyolefin.
7. The membrane of claim 6, wherein the polyolefin is a polyethylene.
8. The membrane of claim 7, wherein the polyethylene is ultra-high molecular weight polyethylene.
9. The membrane of any of claims 1 to 5, wherein the membrane comprises a halogenated polymer.
10. The membrane of claim 9, wherein the halogenated polymer is chosen from polytetrafluoroethylene (PTFE), polychlorotrifluoro-ethylene (PCTFE), fluorinated ethylene polymer (FEP), polyhexafluoropropylene, and polyvinylidene fluoride (PVDF).
11. The membrane of claim 10, wherein the halogenated polymer is polytetrafluoroethylene (PTFE).

12. A method of removing one or more metal(s) or metal ion(s) from a liquid composition, said liquid composition comprising at least one ketone, the method comprising:
    (i) contacting the membrane of any of claims 1 to 11 with a liquid composition comprising at least one ketone and one or more metals or metal ions; and
    (ii) reducing an amount of the one or more metals or metal ions in the liquid composition, thereby providing a purified liquid composition.
13. The method of claim 12, wherein said purified liquid composition maintains a water white appearance for up to 7 days upon storage in an inert atmosphere.
14. The method of claim 12 or 13, wherein contacting the membrane with a liquid composition comprising at least one ketone for seven days leads to the liquid composition having an increase in the sum of dimeric and oligomeric condensation species in the liquid composition in a range from greater than 0% to less than 100% as compared to the sum of dimeric and oligomeric condensation species in the liquid composition before it is contacted with the membrane.
15. The method of any one of claims 12 to 14, wherein the liquid composition comprises a ketone chosen from cyclohexanone and methyl isobutyl ketone.
16. The method of any one of claims 12 to 15, wherein the liquid composition further comprises one or more of n-butyl acetate, isopropyl alcohol, 2-ethoxyethyl acetate, xylene, ethyl lactate, isopentyl ether, methyl-2-hydroxyisobutyrate, methyl isobutyl carbinol, isoamyl acetate, undecane, propylene glycol methyl ether, propylene glycol monomethyl ether acetate, and a mixed solution of propylene glycol monomethyl ether (PGME) and PGMEA having a (7:3) mixing ratio and surface tension of 27.7 mN/m.
17. The method of claim 16, wherein the liquid composition comprises isopropyl alcohol.
18. The method of any one of claims 12 to 17, wherein the one or more metal or metal ions are chosen from Li, B, Na, Mg, Al, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Mo, Cd, Sn, Ba, and Pb metals or metal ions, either individually or in combinations of two or more thereof.

19. The method of any one of claims 12 to 18, wherein the metal ions are chosen from iron, chromium, manganese, aluminum, and nickel cations.
20. A filter comprising a membrane, the membrane comprising at least one strong acid functional group having a cationic counterion chosen from ammonium, C_1-C_6 alkylammonium, phosphonium, C_1-C_6 alkyl phosphonium, imidazolium, pyridinium, guanidinium, sulfonium, pyrrolidinium, and pyrimidinium.
21. The filter of claim 20, wherein the cationic counterion is ammonium
22. The filter of claim 20 or 21, wherein the strong acid functional group is chosen from sulfonic acid and/or phosphonic acid groups.
23. The filter of claim 20 or 21, wherein the strong acid functional group is a sulfonic acid group.
24. The filter of any of claims 20 to 23, wherein the membrane comprises a polyolefin.
25. The filter of claim 24, wherein the polyolefin is a polyethylene.
26. The filter of claim 25, wherein the polyethylene is ultra-high molecular weight polyethylene.
27. The filter of any of claims 20 to 23, wherein the membrane comprises a halogenated polymer.
28. The filter of claim 27, wherein the halogenated polymer is chosen from polytetrafluoroethylene (PTFE), polychlorotrifluoro-ethylene (PCTFE), fluorinated ethylene polymer (FEP), polyhexafluoropropylene, and polyvinylidene fluoride (PVDF).
29. The filter of claim 28, wherein the halogenated polymer is polytetrafluoroethylene (PTFE).
30. The filter of any one of claims 20 to 29, further comprising a filter material, wherein the filter material contacts the membrane, and the filter material is different from the membrane.