We claim:

1. A copolymer for use in membrane filters, comprising a plurality of zwitterionic repeat units, and a plurality of hydrophobic repeat units;

wherein at least some of the hydrophobic repeat units each independently comprise a cross-linkable moiety; and

wherein the copolymer is poly((allyl methacrylate)-random-(sulfobetaine methacrylate)), poly((allyl methacrylate)-random-(2-methacryloyloxyethyl phosphorylcholine)), or combinations thereof.

2. The copolymer of claim 1, wherein the copolymer has a molecular weight of 10,000 to 10,000,000 Dalton; or a molecular weight of 20,000 to 500,000 Dalton.

3. The copolymer of claim 1 or 2, wherein the zwitterionic repeat units and the hydrophobic repeat units each constitute 20-80% by weight of the copolymer.

4. The copolymer of claim 3, wherein the zwitterionic repeat units constitute 25-75% by weight of the copolymer, and the hydrophobic repeat units constitute 25-75% by weight of the copolymer.

5. The copolymer of any one of claims 1 - 4, wherein the zwitterionic repeat units constitute 25-75% by weight of the copolymer, and the copolymer has a molecular weight of 20,000 to 100,000 Dalton.

6. A cross-linked copolymer network, comprising the copolymer of any one of claims 1-5.

7. A thin film composite membrane, comprising a porous substrate, and a selective layer comprising the cross-linked copolymer network of claim 6, wherein the average effective pore size of the porous substrate is larger than the average effective pore size of the selective layer; and the selective layer is disposed on top of the porous substrate.

8. The thin film composite membrane of claim 7, wherein the selective layer has an average effective pore size of 0.1 nm to 2.0 nm; 0.1 nm to 1.2 nm; or 0.5 nm to 1.0 nm.

9. The thin film composite membrane of claim 7 or 8, wherein the selective layer has a thickness of 10 nm to 10 µm; or a thickness of 100 nm to 2 µm.

10. The thin film composite membrane of any one of claims 7-9, wherein the thin film composite membrane rejects charged solutes and salts.

11. The thin film composite membrane of any one of claims 7-10, wherein the selective layer exhibits sulfonate (SO_4^{2-}) rejection of greater than 99%.

12. The thin film composite membrane of any one of claims 7-10, wherein the selective layer exhibits sulfonate (SO_4^{2-}) / chloride (Cl^-) separation factor of greater than 50 or separation factor of 75.

13. The thin film composite membrane of any one of claims 7-10, wherein the selective layer exhibits different anion rejections for salts with the same cation.

14. The thin film composite membrane of any one of claims 7-10, wherein the selective layer exhibits different anion rejections for salts selected from NaF, NaCl, NaBr, NaI, and $NaClO_4$.

15. The thin film composite membrane of any one of claims 7-10, wherein the selective layer exhibits a fluoride (F^-) / chloride (Cl^-) separation factor of greater than 5 or separation factor of 8.

16. The thin film composite membrane of any one of claims 7-10, wherein the selective layer exhibits different rejections for monosaccharides and disaccharides.

17. The thin film composite membrane of any one of claims 7-10, wherein the selective layer exhibits a glucose / sucrose separation factor of greater than 10.

18. The thin film composite membrane of any one of claims 7-10, wherein the selective layer exhibits a xylose / sucrose separation factor of greater than 18.

19. The thin film composite membrane of any one of claims 14-18, wherein the selective layer exhibits resistance to fouling by an oil emulsion.

20. The thin film composite membrane of any one of claims 14-18, wherein the selective layer is stable upon exposure to chlorine bleach (e.g., at pH 4).

21. The thin film composite membrane of any one of claims 14-20, wherein the selective layer exhibits size-based selectivity between uncharged organic molecules.

22. The thin film composite membrane of claim 21, wherein the selective layer exhibits rejection of > 99% for neutral molecule with hydrated diameter of greater than 1 nm.