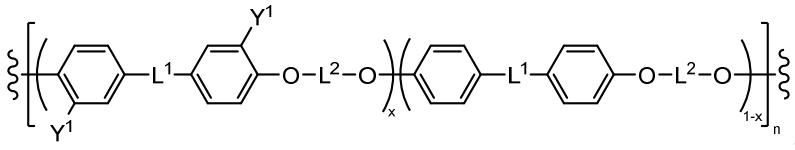
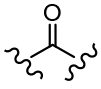
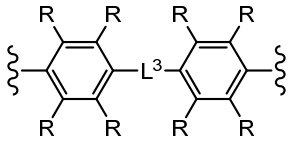
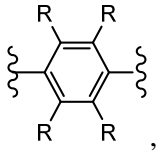
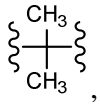
[0003a] In one aspect, the present disclosure refers to a copolymer comprising the structure:

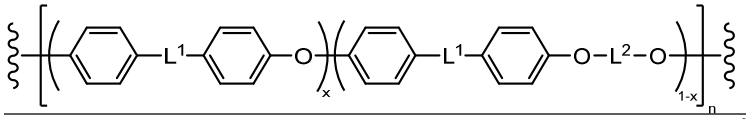


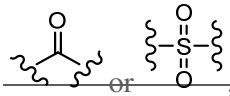
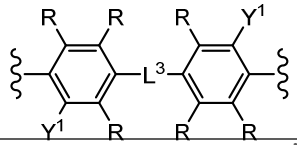
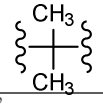
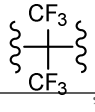
wherein each L^1 is independently  or , wherein each L^2 is independently  or , wherein each L^3 is independently a single bond, , or , wherein one Y^1 is SO_3Z and the other Y^1 is H, wherein Z is a counterion, and wherein each R is independently H, F, or CH_3;

the value of x is between 0 to 1, and the value for n is from 2 to 100,000.

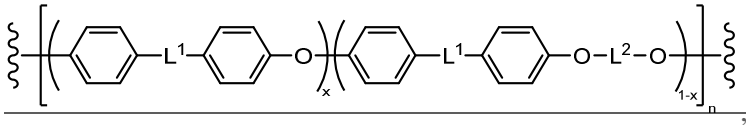
[0003b] In another aspect, the present disclosure refers to a crosslinked network comprising: the copolymer as disclosed herein in crosslinked form; blends of different molecular weights of copolymers as disclosed herein in crosslinked form; or blends of a single molecular weight or different molecular weights of copolymers as disclosed herein and one or more small molecule polymerizable reagents, in crosslinked form.

~~**[0003c]** In another aspect, the present disclosure refers to a copolymer comprising the structure:~~

~~~~

~~, where each L^1 is independently~~  ~~or~~ ~~, wherein each L^2 is~~ ~~, wherein each L^3 is independently a single bond,~~ ~~, or~~ ~~, wherein at least one or both Y^1 is SO_3Z, wherein Z is a counterion, and wherein each R is independently H, F, or CH_3; the value of x is 0 to 1, and the value for n is from 2 to 100,000.~~

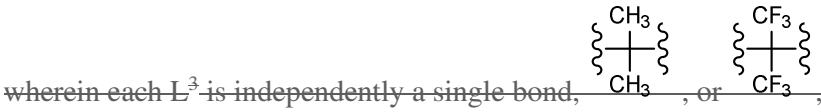
~~**[0003d]** In another aspect, the present disclosure refers to a copolymer comprising the structure:~~



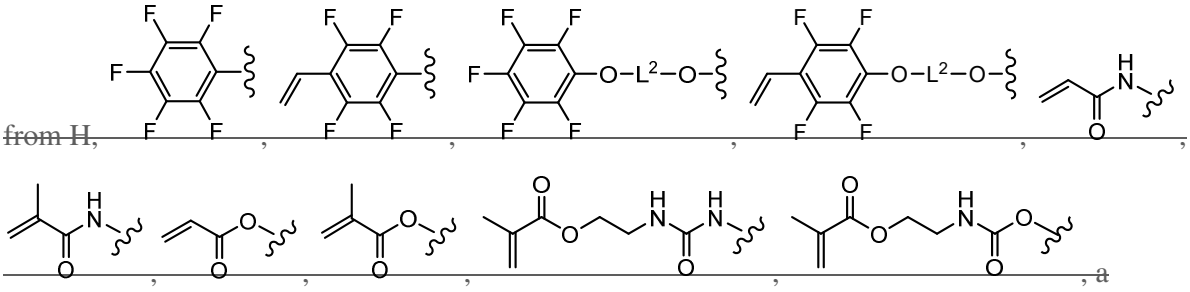
~~, where each L^1 is independently~~



~~or , wherein each L^2 is independently , or~~



~~wherein each L^3 is independently a single bond, , or , wherein at least one or all Y^1 is SO_3Z, wherein Z is a counterion, and wherein each R is independently H, F, or CH_3, further comprising one or more terminating groups A, each terminating group A independently selected from H,~~



~~, a phenol, or an aminophenol, the value of x is 0 to 1, and the value for n is from 2 to 100,000.~~

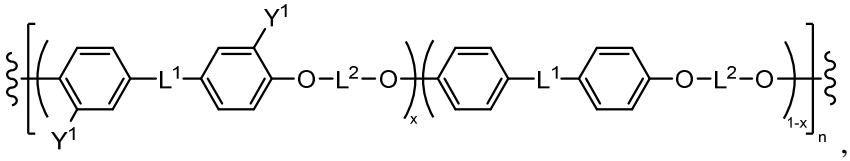
[0003~~e~~c] In another aspect, the present disclosure refers to a water desalination membrane comprising the copolymer as disclosed herein.

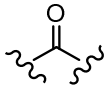
[0003~~f~~d] In another aspect, the present disclosure refers to a water desalination membrane comprising the crosslinked network as disclosed herein.

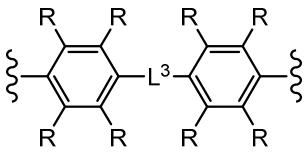
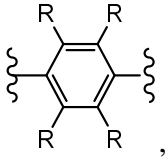
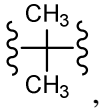
[0004] In one example, linear sulfonated poly(arylene ether)s are provided. Linear sulfonated polymers may be copolymers, such as polymers comprising two or more different monomer units. The polymers may be polymerized via chemical reaction between monomers. Linear sulfonated

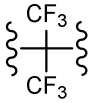
WHAT IS CLAIMED IS:

1. A copolymer comprising the structure:



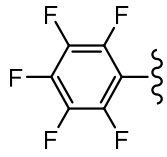
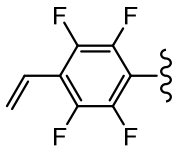
wherein each L^1 is independently  or , wherein each L^2 is independently

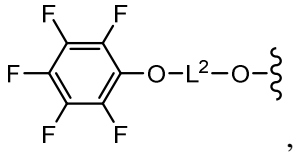
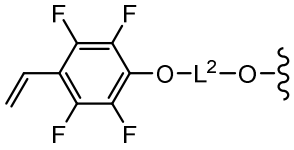
 or , wherein each L^3 is independently a single bond, ,

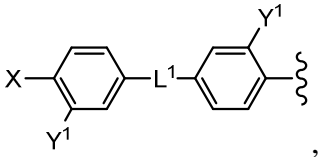
or , wherein one Y^1 is SO_3Z and the other Y^1 is H, wherein Z is a counterion, and wherein each R is independently H, F, or CH_3;

the value of x is between 0 to 1, and the value for n is from 2 to 100,000.

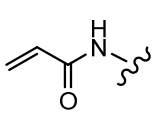
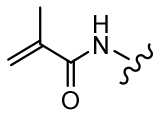
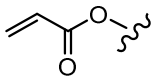
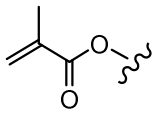
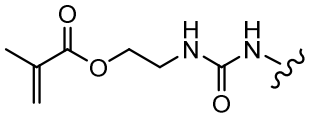
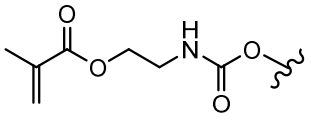
2. The copolymer of claim 1, further comprising one or more terminating groups A,

each terminating group A independently selected from H, , ,

, , a phenol, an aromatic amine derived from an

aminophenol as an endcapping agent in the copolymerization, or ,

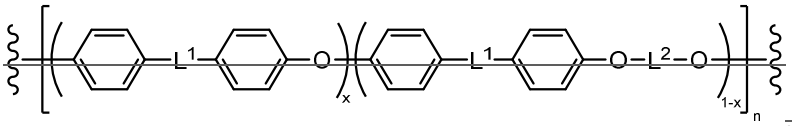
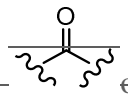
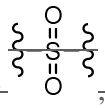
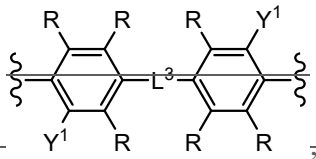
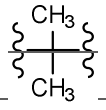
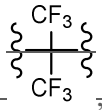
wherein X is a halogen, one Y^1 is SO_3Z and the other Y^1 is H or both Y^1 are H.

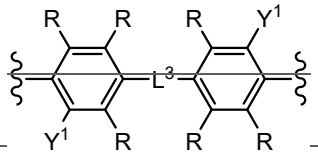
3. The copolymer of claim 1, further comprising one or more terminating groups A, each terminating group A independently selected from , , , , , or .

4. A crosslinked network comprising:

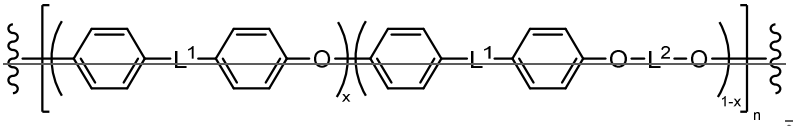
the copolymer of claim 2 or claim 3 in crosslinked form; blends of different molecular weights of copolymers of claim 2 or claim 3 in crosslinked form; or blends of a single molecular weight or different molecular weights of copolymers of claim 2 or claim 3 and one or more small molecule polymerizable reagents, in crosslinked form.

~~5. A copolymer comprising the structure:~~

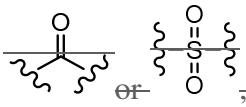
 ~~, where each L^1 is independently~~  ~~or~~  ~~, wherein each L^2 is~~  ~~, wherein each L^3 is independently a single bond,~~  ~~, or~~  ~~, wherein at least one or both Y^1 is SO_3Z, wherein Z is a counterion, and wherein each R is independently H, F, or CH_3; the value of x is 0 to 1, and the value for n is from 2 to 100,000.~~

~~6. The copolymer of claim 5, wherein each L^2 is~~  ~~wherein L^3 is a single bond, wherein at least one or both Y^1 is SO_3Z, wherein Z is a counterion, and wherein each R is H or CH_3.~~

~~7. A copolymer comprising the structure:~~

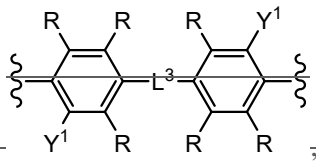


~~, where each L^1 is independently~~

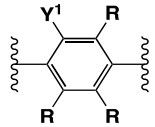


~~or~~

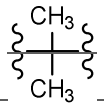
~~, wherein each L^2 is independently~~



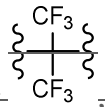
~~, or~~



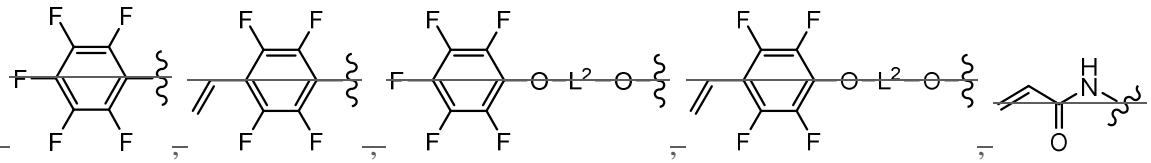
~~wherein each L^3 is independently a single bond,~~



~~, or~~



~~, wherein at least one or all Y^1 is SO_3Z, wherein Z is a counterion, and wherein each R is independently H, F, or CH_3, further comprising one or more terminating groups A, each terminating group A independently selected from H,~~



~~, a phenol, or an aminophenol, the value of x is 0 to 1, and the value for n is from 2 to 100,000.~~

~~8. A crosslinked network comprising: the copolymer of claim 7 in crosslinked form; blends of different molecular weights of copolymers of claim 7 in crosslinked form; or blends of a single molecular weight or different molecular weights of copolymers of claim 7 and one or more small molecule polymerizable reagents, in crosslinked form.~~

5~~9~~. A water desalination membrane comprising the copolymer of any one of claims 1-3 ~~or 5-7~~.

6~~10~~. The water desalination membrane of claim 5~~9~~ exhibiting a rejection of aqueous monovalent ions of over 95% in the presence of polyvalent cations.

7~~11~~. A water desalination membrane comprising the crosslinked network of claim 4.

8~~12~~. The water desalination membrane of claim 7~~11~~ exhibiting a rejection of aqueous monovalent ions of over 95% in the presence of polyvalent cations.

~~13. A water desalination membrane comprising the crosslinked network of claim 8.~~

~~14. The water desalination membrane of claim 13 exhibiting a rejection of aqueous monovalent ions of over 95% in the presence of polyvalent cations.~~