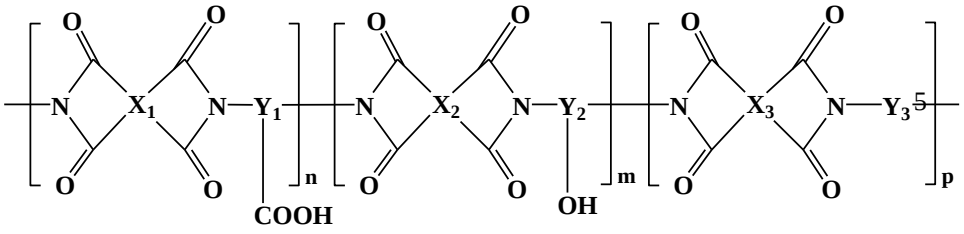
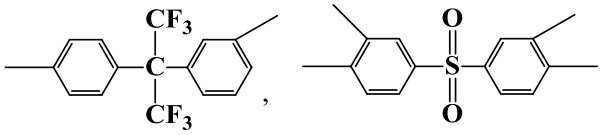
CLAIMS:

1. A self-cross-linkable aromatic polyimide polymer comprising a formula (I)

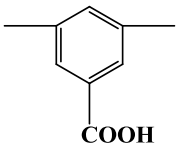


(I)

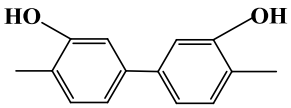
wherein X_1, X_2, and X_3 are selected from the group consisting of



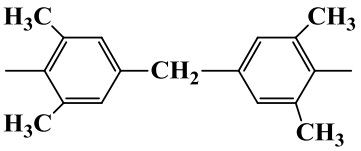
and mixtures thereof, respectively; X_1, X_2, and X_3 are the same or different from each other; Y_1-COOH is



; Y_2-OH is



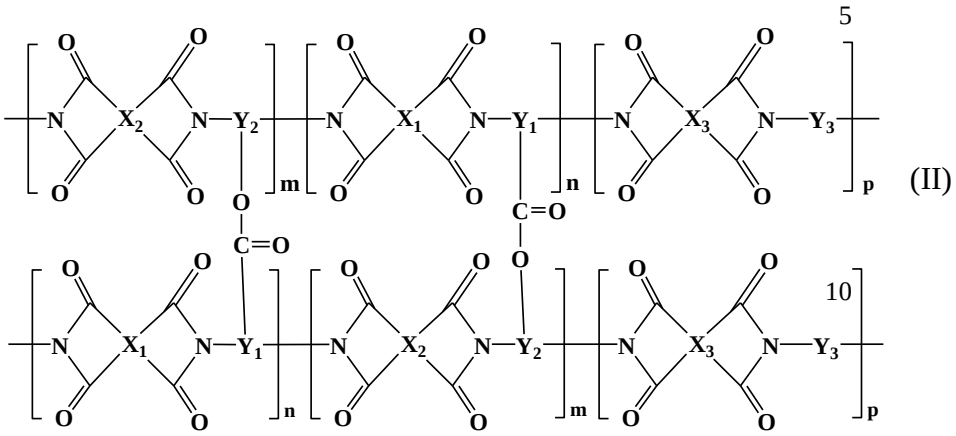
; Y_3 is



; n, m, and p are independent integers from 2 to 500; the molar ratio of (n+m)/p is in a range of 1:20 to 1:0; the molar ratio of n/m is in a range of 1:10 to 10:1.

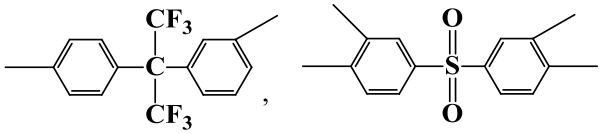
2. A membrane comprising the self cross-linkable aromatic polyimide of claim 1.

3. The self-cross-linkable aromatic polyimide polymer of claim 1 that is crosslinked to become a self-cross-linked aromatic polyimide polymer comprising a formula (II):

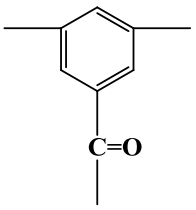


(II)

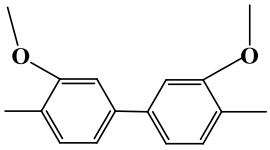
wherein X_1, X_2, and X_3 are selected from the group consisting of



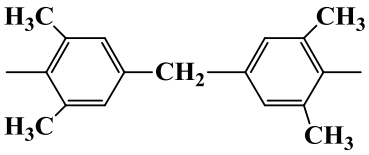
and mixtures thereof, respectively; X_1, X_2, and X_3 are the same or different from each other; Y_1-CO- is



; Y_2-O- is



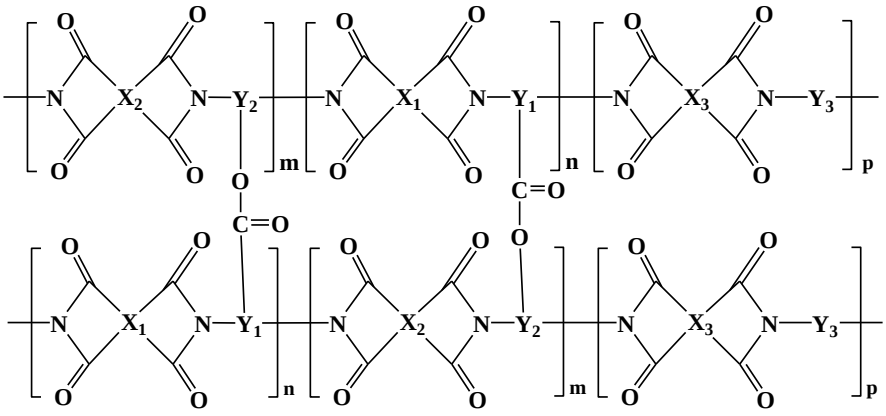
; Y_3 is



; n, m, and p are independent integers from 2 to 500; the molar ratio of (n+m)/p is in a range of 1:20 to 1:0; and the molar ratio of n/m is in a range of 1:10 to 10:1.

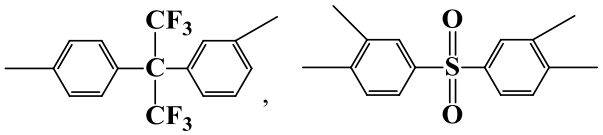
4. A membrane comprising the self-cross-linked aromatic polyimide polymer of claim 3.

5. A process for separating at least one gas from a mixture of gases comprising providing a self-cross-linked aromatic polyimide membrane of formula (II) comprising

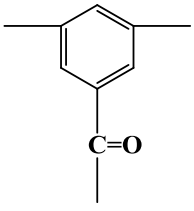


(II)

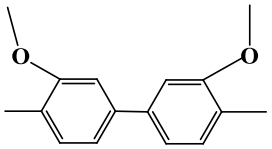
wherein X_1, X_2, and X_3 are selected from the group consisting of



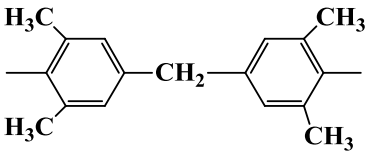
and mixtures thereof, respectively; X_1, X_2, and X_3 are the same or different from each other; Y_1-CO- is



; Y_2-O- is



; Y_3 is



; n, m, and p are independent integers from 2 to 500; the molar ratio of (n+m)/p is in a range of 1:20 to 1:0; and the molar ratio of n/m is in a range of 1:10 to 10:1, contacting the mixture of gases to one side of the self-cross-linked aromatic polyimide membrane of formula (II) to cause at least one gas to permeate said membrane; and removing from an opposite side of said self-cross-linked aromatic polyimide membrane of formula (II) a permeate gas composition comprising a portion of said at least one gas that permeated said membrane.

6. The process of claim 5 wherein said mixture of gases comprises a mixture of carbon dioxide and methane, a mixture of hydrogen and methane, a mixture of helium and methane, a mixture of at least one volatile organic compound and at least one atmospheric gas, a mixture of nitrogen and hydrogen, a mixture of carbon dioxide, oxygen, nitrogen, water vapor, hydrogen sulfide, helium and methane or a mixture of paraffins and olefins.

7. A process for separation of liquid mixtures by pervaporation comprising contacting said liquid mixture with a membrane comprising the self-cross-linked aromatic polyimide membrane of claims 3-4.