CLAIMS:

1. A system for xylene isomerization and separation, comprising:

a separation stage based on boiling point separation configured to generate at least a para-xylene enriched fraction;

a xylene recovery unit in fluid communication with the separation stage for receiving the para-xylene enriched fraction from the separation stage, the xylene recovery unit comprising a product outlet and a residual outlet;

a membrane structure in fluid communication with the residual outlet for receiving at least a portion of residual stream; and

a liquid phase isomerization reactor in fluid communication with the membrane structure for receiving a retentate from the membrane structure,

wherein the membrane structure comprises a plurality of membrane layers, a first membrane layer of the membrane structure comprising a pore volume of at least 0.2 cm^3/g of pores with a median pore size of at least 20 nm, a second membrane layer of the membrane structure comprising a porous carbon layer having a BET surface area of at least about 100 m^2/g, the second membrane layer having a pore size distribution comprising a smallest substantial pore size peak having a median pore size of about 5.8 Angstroms to about 6.8 Angstroms.

2. The system of claim 1, wherein the separation stage is further configured to generate a lower boiling fraction, a bottoms fraction, or a combination thereof.

3. The system of claim 1, wherein the xylene recovery unit comprises a para-xylene crystallizer, a simulated moving bed separator, or a combination thereof.

4. The system of claim 1, wherein the first membrane layer comprises a porous carbon layer or wherein the first membrane layer comprises a porous metal structure.

5. A system for xylene isomerization and separation, comprising:

a separation stage based on boiling point separation configured to generate at least a para-xylene enriched fraction;

at least one membrane structure for forming a permeate comprising para-xylene and a retentate; and

an isomerization reactor in fluid communication with the membrane structure for receiving the retentate from the membrane structure,

wherein the at least one membrane structure comprises a plurality of membrane layers, a first membrane layer of the membrane structure comprising a pore volume of at least 0.2 cm^3/g of pores with a median pore size of at least 20 nm, a second membrane layer of the membrane structure comprising a porous carbon layer having a BET surface area of at least about 100 m^2/g, the second membrane layer having a pore size distribution comprising a smallest substantial pore size peak having a median pore size of about 5.8 Angstroms to about 6.8 Angstroms.

6. The system of claim 5, wherein the isomerization reactor comprises a liquid phase isomerization reactor.

7. The system of claim 5, wherein the at least one membrane structure is in fluid communication with the separation stage for receiving the para-xylene enriched stream, the isomerization reactor being in fluid communication with the separation stage for recycle of at least a portion of an isomerized retentate to the separation stage.

8. The system of claim 5, wherein the at least one membrane structure comprises a first membrane structure and a second membrane structure,

the isomerization reactor being in fluid communication with the separation stage for receiving the para-xylene enriched stream,

the first membrane structure being in fluid communication with the isomerization reactor for receiving at least a portion of an isomerized para-xylene enriched stream to form a first permeate and a first retentate, the first membrane structure being in fluid communication with the separation stage for recycle of at least a portion of the first retentate to the separation stage, and

the second membrane structure being in fluid communication with the first membrane structure for receiving the first permeate to form a second permeate and a second retentate, the second membrane structure being in fluid communication with the isomerization reactor to recycle at least a portion of the second retentate to the isomerization reactor.

9. The system of claim 5, the system further comprising a xylene recovery unit, the isomerization reactor being in fluid communication with the separation stage for receiving the para-xylene enriched stream,

the at least one membrane structure being in fluid communication with the isomerization reactor for receiving at least a portion of an isomerized para-xylene enriched stream to form a permeate and a retentate, the at least one membrane structure being in fluid communication with the separation stage for recycle of at least a portion of the retentate to the separation stage, and

the xylene recovery unit being in fluid communication with the at least one membrane structure for receiving at least a portion of the permeate, the xylene recovery unit comprising a product outlet and a residual outlet, the isomerization reactor being in fluid communication with the residual outlet.

10. The system of claim 5, wherein the first membrane layer comprises a porous carbon layer or wherein the first membrane layer comprises a porous metal structure.