CLAIMS

What is claimed is:

1. A process for producing ethylbenzene or cumene comprising the steps of:

(a) providing an transalkylation catalyst composition to a reaction zone, said transalkylation catalyst comprising a zeolite having a framework structure selected from the group consisting of FAU, BEA*, MOR, MWW and mixtures thereof, wherein the silica-alumina molar ratio of said zeolite is in a range of 10 to 15, wherein said transalkylation catalyst composition is in the form of an extrudate having an external surface area/volume ratio in the range of 40 cm^{-1} to 85 cm^{-1};

(b) providing a stream comprising a poly-alkylated benzene and a portion of an alkylatable aromatic compound stream to said reaction zone, wherein said poly-alkylated benzene stream comprises di-ethylbenzene or di-isopropylbenzene and said alkylatable aromatic compound stream comprises benzene;

(c) contacting said poly-alkylated benzene stream with said alkylatable aromatic compound stream in the presence of said transalkylation catalyst composition under at least partial liquid phase transalkylation conditions to alkylate the alkylatable aromatic compound and produce a transalkylation effluent stream comprising ethylbenzene or cumene,

(d) providing a stream comprising an alkylating agent and another portion of said alkylatable aromatic compound stream to another reaction zone;

(e) contacting said another portion of said alkylatable aromatic compound stream with said stream comprising an alkylating agent under alkylation conditions in the presence of an alkylation catalyst to alkylate the alkylatable aromatic compound and produce an alkylation effluent stream which comprises mono-alkylated benzene and said poly-alkylated benzene;

(f) separating said alkylation effluent stream to recover said poly-alkylated benzene stream; and

(g) supplying at least a portion of said poly-alkylated benzene stream to step (b).

2. The process of claim 1, wherein said alkylatable aromatic compound stream comprising benzene is an impure stream which further comprises nitrogenous impurities.

3. The process of claim 2, further comprising the step of contacting said impure stream with a treatment material under treatment conditions to remove at least a portion of said nitrogenous impurities,

wherein said treatment conditions include a temperature from 30ºC to 200ºC, a weight hourly space velocity (WHSV) of from 0.1 hr^{-1} and 200 hr^{-1}, and a pressure between about ambient and 3000 kPa,

wherein said treatment material is selected from the group consisting of a clay, a resin, an activated alumina, a molecular sieve and combinations thereof, wherein said molecular sieve is selected from the group consisting of Linde X, Linde A, zeolite beta, faujasite, zeolite Y, Ultrastable Y (USY), Dealuminized Y (Deal Y), Rare Earth Y (REY), Ultrahydrophobic Y (UHP-Y), mordenite, TEA-mordenite, ZSM-3, ZSM-4, ZSM-14, ZSM-18, ZSM-20 and combinations thereof.

4. The process of any preceding claim, further comprising the steps:

(h) separating said transalkylation effluent stream to recover an ethylbenzene stream or a cumene stream, and

(i) separating said alkylation effluent stream to recover an ethylbenzene stream or a cumene stream.

5. The process of any preceding claim, wherein said mono-alkylated benzene is ethylbenzene, said poly-alkylated benzene is poly-ethylbenzene and said alkylating agent is ethylene.

6. The process of any preceding claim, wherein said mono-alkylated benzene is cumene, said poly-alkylated benzene is poly-isopropylbenzene, and said alkylating agent is propylene.

7. The process of any preceding claim, wherein said at least partial liquid phase transalkylation conditions include a temperature of 100ºC to 300ºC, a pressure of 200 kPa to 600 kPa, weight hourly space velocity (WHSV) based on the total feed of 0.5 hr^{-1} to 100 hr^{-1}, and an aromatic/poly-alkylated compound weight ratio of 1:1 to 6:1; preferably a temperature of 100ºC to 200ºC and a pressure of 200 kPa to 600 kPa.

8. The process of any preceding claim, wherein said alkylation conditions are at least partially liquid phase conditions and include a temperature of 150°C to 300ºC and a pressure of up to 20000 kPa, and a WHSV based on the weight of said alkylating agent from 0.1 hr^{-1} to 30 hr^{-1}.

9. The process of any preceding claim, wherein said zeolite which has said FAU framework structure is selected from the group consisting of 13X, low sodium ultrastable Y (USY), dealuminized Y (Deal Y), ultrahydrophobic Y (UHP-Y), rare earth exchanged Y (REY), rare earth exchanged USY (RE-USY), and mixtures thereof.

10. The process of any preceding claim, wherein said zeolite which has said BEA* framework structure is zeolite beta.

11. The process of any preceding claim, wherein said zeolite which has said MOR framework structure is selected from the group consisting of mordenite, EMM-34, TEA-mordenite, and mixtures thereof.

12. The process of any preceding claim, wherein said zeolite which has said MWW framework structure is a MCM-22 family molecular sieve and combinations thereof.

13. The process of claim 12, wherein said MCM-22 family molecular sieve is any one of MCM-22, PSH-3, SSZ-25, MCM-36, MCM-49, MCM-56, ERB-1, EMM-10, EMM-10-P, EMM-12, EMM-13, UZM-8, UZM-8HS, UZM-37, ITQ-1, ITQ-2, ITQ-30, or combinations of two or more thereof.

14. The process of any preceding claim, wherein said alkylation catalyst comprises an aluminosilicate.

15. The process of claim 14, wherein said aluminosilicate is any one of a MCM-22 family molecular sieve, faujasite, mordenite, zeolite-beta, or combinations of two or more thereof.