CLAIMS

1. A method for removing impurities from a hydrocarbon stream, the method comprising the steps of:

(a) supplying a portion of an untreated feed stream, said feed stream comprising one or more hydrocarbons and undesirable impurities, said impurities comprise at least one compound having at least one of the following elements: nitrogen, halogens, oxygen, sulfur, arsenic, selenium, tellurium, phosphorus, and Group 1 through Group 12 metals,

(b) supplying a guard bed material which comprises a zeolite having a Constraint Index of less than 3 and a mesoporous binder,

wherein said mesoporous binder comprises a mesoporous metal oxide which has a particle diameter of greater than or equal to 20 μm at 50% of the cumulative particle size distribution (d_{50}), a pore volume of less than 1 cc/g and an alumina content greater than or equal to 75%, by weight,

wherein the ratio of said zeolite to said mesoporous metal oxide is in the range from 95:5 to 5:95, by weight,

wherein said guard bed material has one or more of the following properties:

(i) an Alpha Value of greater than or equal to 500,

(ii) a Collidine Uptake of greater than or equal to 600 μmoles/g, and

(iii) a Temperature Programmed Ammonia Desportion of greater than or equal to 0.70 meq/g; and

(c) contacting said portion of said untreated feed stream with said guard bed material under treatment conditions to remove at least a portion of said impurities and produce a treated feed stream having a reduced amount of impurities.

2. The method of claim 1, wherein said zeolite has a framework structure which includes one or more of BEA*, FAU, MOR, and MWW.

3. The method of claim 2, wherein said framework structure of BEA* comprises zeolite beta, said framework structure of FAU includes one or more of faujasite, zeolite Y, USY, Deal-Y, UHP-Y, and REY, said MOR framework structure incudes one or more of mordenite, TEA-mordenite, EMM-34, and UZM-14, said framework structure

of MWW comprises a MCM-22 family material selected from the group consisting 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, MIT-1, ITQ-1, ITQ-2, ITQ-30, and mixtures of two or more thereof.

4. The method of any preceding claim, wherein said mesoporous metal oxide comprises any one of aluminum hydroxide, boehmite, pseudoboehmite alumina, aluminum oxide, amorphous silica-alumina and mixtures of two or more thereof.

5. The method of claim 1, wherein said zeolite is zeolite beta and said mesoporous metal oxide is pseudoboehmite.

6. A process for producing a mono-alkylated aromatic compound, the process comprising the step of:

(a) supplying a portion of an untreated feed stream, said feed stream comprising one or more alkylatable aromatic compounds and undesirable impurities, said impurities comprise at least one compound having at least one of the following elements: nitrogen, halogens, oxygen, sulfur, arsenic, selenium, tellurium, phosphorus, and Group 1 through Group 12 metals;

(b) supplying a guard bed material which comprises a zeolite having a Constraint Index of less than 3 and a mesoporous binder,

wherein said mesoporous binder comprises a mesoporous metal oxide having a particle diameter of greater than or equal to 20 μm at 50% of the cumulative particle size distribution (d_{50}), a pore volume of less than 1 cc/g and an alumina content greater than or equal to 75%, by weight,

wherein the ratio of said zeolite to said mesoporous metal oxide is in the range from 95:5 to 5:95, by weight,

wherein said guard bed material has one or more of the following properties:

(i) an Alpha Value of greater than or equal to 500,

(ii) a Collidine Uptake of greater than or equal to 600 μmoles/g, and

(iii) a Temperature Programmed Ammonia Desportion of greater than or equal to 0.70 meq/g;

(c) contacting said portion of said untreated feed stream with said guard bed material under treatment conditions to remove at least a portion of said impurities and produce a treated feed stream having a reduced amount of impurities and said alkylatable aromatic compounds; and

(d) contacting at least a portion of said treated feed stream and an alkylating agent stream in the presence of an alkylation catalyst under suitable at least partially liquid phase alkylation conditions to alkylate at least a portion of said alkylatable aromatic compounds with said alkylating agent stream to produce an effluent stream comprising said mono-alkylated aromatic compound and poly-alkylated aromatic compounds.

7. The process of claim 6, wherein said alkylating agent stream is contacted with said composition and said treated feed stream to produce additional mono-alkylated and poly-alkylated aromatic compounds while said impurities are removed.

8. The process of any one of claim 6 or claim 7, wherein said alkylation catalyst comprises an acidic aluminosilicate.

9. The process of claim 8, wherein said aluminosilicate is any one of a MCM-22 family molecular sieve, faujasite, mordenite, zeolite beta, or combinations of two or more thereof.

10. The process of claim 9, 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, MIT-1, or combinations of two or more thereof.

11. The process of any one of claims 6 to 10, further comprising the steps:

(e) separating said effluent stream of step (c) to recover a mono-alkylated aromatic compound stream and a poly-alkylated aromatic compounds stream.

12. The process of claim 11, further comprising the step of:

(f) contacting said poly-alkylated aromatic compound stream and another portion of said treated feed stream in the presence of a transalkylation catalyst under

suitable at least partially liquid phase transalkylation conditions to transalkylate said poly-alkylated aromatic compound stream with said alkylatable aromatic compound and produce additional said mono-alkylated aromatic compound.

13. The process of claim 12, wherein said transalkylation catalyst is a large pore molecular sieve or a MCM-22 family molecular sieve.

14. The process of claim 13, wherein said large pore molecular sieve is selected from the group of consisting of zeolite beta, faujasite, zeolite Y, Ultrastable Y (USY), Dealuminized Y (Deal Y), Rare Earth Y(REY), Ultrahydrophobic Y (UHP-Y), mordenite, TEA-mordenite, EMM-34, ZSM-2, ZSM-3, ZSM-4, ZSM-12, ZSM-14, ZSM-18, ZSM-20, ZSM-50, MCM-68, ECR-4, ECR-17, ECR-32, ECR-35 and mixtures of two or more thereof.

15. The process of claim 13, 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, MIT-1, or combinations of two or more thereof.

16. The process of any one of claims 6 to 15, wherein said alkylatable aromatic compound is benzene, said alkylating agent is ethylene, said mono-alkylated aromatic compound is ethylbenzene and said poly-alkylated aromatic compound is poly-ethylbenzene.

17. The process of any one of claims 6 to 15, wherein said alkylatable aromatic compound is benzene, said alkylating agent is propylene, said mono-alkylated aromatic compound is cumene and said poly-alkylated aromatic compound is poly-isopropylbenzene.

18. A guard bed material comprising,

(a) a zeolite having a Constraint Index of less than 3 and a framework structure which includes one or more of BEA*, FAU, MOR, and MWW; and

(b) a mesoporous binder which comprises a mesoporous metal oxide having a particle diameter of greater than or equal to 20 μm at 50% of the cumulative particle size distribution (d_{50}), a pore volume of less than 1 cc/g and an alumina content greater than or equal to 75%, by weight, said mesoporous metal oxide comprises any one of aluminum hydroxide, boehmite, pseudoboehmite alumina, aluminum oxide, amorphous silica-alumina and mixtures of two or more thereof;

wherein the ratio of said zeolite to said mesoporous metal oxide is in the range from 95:5 to 5:95, by weight,

wherein said guard bed material has one or more of the following properties:

(i) an Alpha Value of greater than or equal to 500,

(ii) a Collidine Uptake of greater than or equal to 600 μmoles/g, and

(iii) a Temperature Programmed Ammonia Desportion of greater than or equal to 0.70 meq/g.