CLAIMS

1. A catalyst composition for use in aromatic alkylation processes, comprising a zeolite and a mesoporous binder, said mesoporous binder is a mesporous metal oxide which has a particle diameter of greater than or equal to 20 μm at a median value of the particle size distribution in a sample where the value of the particle diameter is at 50% of the cumulative distribution and a pore volume of less than 1 cc/g, said mesoporous metal oxide has an alumina content of greater than or equal to 75%, by weight, wherein said catalyst composition has a surface area of less than or equal to 300 m^2/g as measured by ASTM D4284 and a normalized critical pore diameter of less than 1 μm.

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

3. The catalyst composition of claim 2, wherein said framework structure which includes BEA* is zeolite beta, said framework structure which includes FAU includes one or more of faujasite, zeolite Y, USY, Deal Y, UHP Y, and REY, said framework structure which includes MOR includes one or more of mordenite, TEA mordenite, EMM-34, and UZM-14, said framework structure which includes MWW is 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 catalyst composition of any preceding claim, wherein said mesoporous metal oxide is pseudoboehmite alumina, amorphous silica-alumina or combinations thereof.

5. The catalyst composition of any preceding claim, wherein said catalyst composition has a normalized critical pore diameter in the range from 0.4 to 0.9 μm.

6. The catalyst composition of any preceding claim, wherein said mesoporous metal oxide has an alumina content of from 75% to 95%, by weight.

~~7. The catalyst composition of any preceding claim, wherein the ratio of said zeolite to said mesoporous metal oxide is in the range of from 1:99 to 100:0 by weight.~~

~~8.~~1. A process for producing a mono-alkylated aromatic compound comprising the step of:

(a) contacting a portion of a stream comprising an alkylatable aromatic compound with a stream comprising an alkylating agent in the presence of an alkylation catalyst under alkylation conditions to produce an alkylation effluent which comprises said mono-alkylated aromatic compound and a poly-alkylated aromatic compound, wherein said alkylation catalyst comprises a first catalyst composition ~~of any of the preceding claims.~~, wherein the first catalyst composition comprises a zeolite and a mesoporous binder, said mesoporous binder is a mesporous metal oxide which has a particle diameter of greater than or equal to 20 µm at a median value of the particle size distribution in a sample where the value of the particle diameter is at 50% of the cumulative distribution and a pore volume of equal to or less than 0.5 cc/g, said mesoporous metal oxide has an alumina content of greater than or equal to 75%, by weight, wherein said catalyst composition has a surface area of less than or equal to 300 m^2/g as measured by ASTM D4284 and a normalized critical pore diameter of less than 1 µm.

2. The process of claim 1, wherein said mesoporous metal oxide is pseudoboehmite alumina, amorphous silica-alumina or combinations thereof.

3. The process of claim 1 or claim 2, wherein said catalyst composition has a normalized critical pore diameter in the range from 0.4 to 0.9 µm.

4. The catalyst composition of any preceding claim, wherein said mesoporous metal oxide has an alumina content of from 75% to 95%, by weight.

5. The catalyst composition of any preceding claim, wherein the ratio of said zeolite to said mesoporous metal oxide is in the range of from 1:99 to 95:0 by weight.

~~9.~~6. The process of claim ~~8~~ 1, wherein said alkylation catalyst further comprises a second catalyst composition, wherein said second catalyst composition comprises another zeolite and another mesoporous binder.

~~10.~~7. The process of claim ~~9~~ 6, wherein said another mesoporous binder of said second catalyst composition is different from said mesoporous binder of said first catalyst composition.

~~11.~~8. The process of claim ~~9~~ 6 or claim ~~10~~ 7, wherein said zeolite of said first catalyst composition is the same or different from said zeolite of said second catalyst composition, either of said zeolite has a framework structure which includes one or more of BEA*, FAU, MOR, and MWW.

~~12.~~9. The process of claim ~~8~~ 1, wherein said alkylation catalyst further comprises a catalyst system.

~~13.~~10. The process of claim ~~11~~ 8, wherein said catalyst system comprises said first catalyst composition and a different second catalyst composition located downstream of and in fluid communication with said first catalyst composition.

~~14.~~11. The process of claim ~~11~~ 8 or claim ~~12~~ 9, wherein said first and said second catalyst compositions are deployed in two or more different catalyst beds, wherein each catalyst bed are in fluid commmunication with each other.

~~15.~~12. The process of claim ~~12~~ 9 or claim ~~13~~ 10, wherein said first catalyst composition has the following properties:

(a) a selectivity to said mono-alkylated aromatic compound greater than said selectivity of said second catalyst composition, and/or

(b) a catalytic activity that is less than said catalytic activity of said second catalyst composition.

~~16.~~13. The process of any one of claims ~~8 to 15~~ 1 to 12, further comprising the steps of:

(b) separating said alkylation effluent stream to recover a stream comprising said mono-alkylated aromatic compound and a stream comprising said poly-alkylated aromatic compound; and

(c) contacting said stream comprising said polyalkylated aromatic compound with another portion of said stream comprising said alkylatable aromatic compound in the presence of a transalkylation catalyst under transalkylation conditions to produce a transalkylation effluent which comprises additional mono-alkylated aromatic compound.

~~17.~~14. The process of claim ~~16~~ 13, wherein said transalkylation catalyst is a large pore molecular sieve having a Constraint Index of less than 2, or a MCM-22 family material.

~~18.~~15. The process of claim ~~17~~ 14, 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.

~~19.~~16. The process of claim ~~17~~ 14, wherein said MCM-22 family material is 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.

~~20.~~17. The process of any one of claims ~~8 to 19~~ 1 to 16, wherein said stream comprising said alkylatable aromatic compound is an impure stream which further comprises impurities selected from compounds having at least one of the following elements: nitrogen, halogens, oxygen, sulfur, arsenic, selenium, tellurium, phosphorus, and Group 1 through Group 12 metals.

~~21.~~18. The process of claim ~~20~~ 17, further comprising the steps of:

(d) supplying said impure stream to a guard bed zone having a guard bed material disposed therein; and

(e) contacting said impure stream with said guard bed material under treatment conditions to remove at least a portion of said impurities to produce a treated stream comprising an alkylatable aromatic compound having a reduced amount of impurities.

~~22.~~19. The process of claim ~~21~~ 18, further comprising the steps of:

(f) supplying an alkylating agent along with said impure stream to said guard bed zone having said guard bed material disposed therein; and

(g) contacting said impure stream and said alkylating agent with said guard bed material under treatment conditions to remove at least a portion of said impurities and to alkylate at least a portion of said alkylatable armatic compound to produce a treated stream, said treated stream having a reduced amount of impurities and comprising an alkylatable aromatic compound and additonal mono-alkylated aromatic compound.

~~23.~~20. The process of claim ~~22~~ 19, wherein said guard bed material is selected from the group consisting of a clay, a resin, an activated alumina, a molecular sieve and mixtures of two or more thereof.

~~24.~~21. The process of claim ~~23~~ 20, wherein said molecular sieve is selected from the group consisting 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, UZM-14, ZSM-3, ZSM-4, ZSM-12, ZSM-14, ZSM-18, ZSM-20 and combinations thereof.

~~25.~~22. The process of any one of claims ~~8 to 24~~ 1 to 21, wherein said alkylatable aromatic compound is benzene.

~~26.~~23. The process of any one of claims ~~8 to 25~~ 1 to 22, wherein said alkylating agent is ethylene, said mono-alkylated aromatic compound is ethylbenzene and said poly-alkylated aromatic compound is poly-ethylbenzene.

~~27.~~24. The process of any one of claims ~~8 to 25~~ 1 to 22, wherein said alkylating agent is propylene, said mono-alkylated aromatic compound is cumene and said poly-alkylated aromatic compound

is poly-isopropylbenzene.