CLAIMS:

1. An aromatics hydrogenation process for a hydrocarbon feedstream comprising:

a) contacting a hydrocarbon feedstream comprising aromatics with a hydrogenation catalyst in the presence of a hydrogen-containing treat gas in a reaction stage operated under effective aromatics hydrogenation conditions to produce a reaction product with reduced aromatics content,

wherein the hydrogenation catalyst comprises:

(i) an organosilica material support, which is a polymer comprising independent units of a monomer of Formula $[Z^1OZ^2OSiCH_2]_3$ (I), wherein each Z^1 and Z^2 independently represent a hydrogen atom, a C_1-C_4 alkyl group or a bond to a silicon atom of another monomer, wherein the organosilica material support has an X-ray diffraction pattern with no peaks in the range of from 3 to 10 degrees 2θ; and

(ii) at least one catalyst metal selected from the group consisting of a Group 8 metal, a Group 9 metal, a Group 10 metal and a combination thereof.

2. The process of claim 1, wherein the organosilica material support further comprises at least one other monomer selected from the group consisting of:

(i) an independent unit of Formula $[Z^3OZ^4SiCH_2]_3$ (II), wherein each Z^3 represents a hydrogen atom, a C_1-C_4 alkyl group or a bond to a silicon atom of another monomer and each Z^4 represents a C_1-C_6 alkyl group; preferably wherein each Z^3 represents a hydrogen atom, a C_1-C_2 alkyl group or a bond to a silicon atom of another siloxane monomer and each Z^4 represents a C_1-C_2 alkyl group;

(ii) an independent unit of Formula $Z^5OZ^6Z^7Z^8Si$ (III), wherein each Z^5 represents a hydrogen atom or a C_1-C_4 alkyl group or a bond to a silicon atom of another monomer; and Z^6, Z^7 and Z^8 are each independently selected from the group consisting of a hydroxyl group, a C_1-C_4 alkyl group, a C_1-C_4 alkoxy group, a nitrogen-containing C_1-C_{10} alkyl group, a nitrogen-containing heteroalkyl group, a nitrogen-containing optionally substituted heterocycloalkyl group and an oxygen atom bonded to a silicon atom of another monomer; preferably wherein each Z^5 represents a hydrogen atom, a C_1-C_2 alkyl group or a bond to a silicon atom of another comonomer; and Z^6, Z^7 and Z^8 are each independently selected from the group consisting of a hydroxyl group, a

C_1-C_2 alkyl group, C_1-C_2 alkoxy group, a nitrogen-containing C_3-C_{10} alkyl group, a nitrogen-containing C_4-C_{10} heteroalkyl group, a nitrogen-containing optionally substituted C_4-C_{10} heterocycloalkyl group and an oxygen bonded to a silicon atom of another monomer;

(iii) an independent unit of Formula $Z^9Z^{10}Z^{11}Si\text{-}R\text{-}SiZ^9Z^{10}Z^{11}$ (IV), wherein each Z^9 independently represents a hydroxyl group, a C_1-C_4 alkoxy group or an oxygen bonded to a silicon atom of another comonomer; each Z^{10} and Z^{11} independently represent a hydroxyl group, a C_1-C_4 alkoxy group, a C_1-C_4 alkyl group or an oxygen bonded to a silicon atom of another monomer; and R is selected from the group consisting a C_1-C_8 alkylene group, a C_2-C_8 alkenylene group, a C_2-C_8 alkynylene group, a nitrogen-containing C_1-C_{10} alkylene group, an optionally substituted C_6-C_{20} aralkyl and an optionally substituted C_4-C_{20} heterocycloalkyl group; preferably wherein each Z^9 represents a hydroxyl group, a C_1-C_2 alkoxy group or an oxygen bonded to a silicon atom of another monomer; each Z^{10} and Z^{11} independently represent a hydroxyl group, a C_1-C_2 alkoxy group, a C_1-C_2 alkyl group or an oxygen bonded to a silicon atom of another monomer; and R is selected from the group consisting of a C_1-C_4 alkylene group, a C_2-C_4 alkenylene group, a C_2-C_4 alkynylene group, a nitrogen-containing C_4-C_{10} alkylene group, an optionally substituted C_6-C_{10} aralkyl and an optionally substituted C_4-C_{12} heterocycloalkyl group;

(iv) an independent unit of Formula $M^1(OZ^{12})_3$ (V), wherein M^1 represents a Group 13 metal and each Z^{12} independently represents a hydrogen atom, a C_1-C_5 alkyl or a bond to a silicon atom of another monomer; preferably wherein M^1 is Al or B and each Z^{12} independently represents a hydrogen atom, a C_1-C_4 alkyl group or a bond to a silicon atom or another monomer;

(v) an independent unit of Formula $(Z^{13}O)_2M^2\text{-}O\text{-}Si(OZ^{14})_3$ (VI) , wherein M^2 represents a Group 13 metal and each Z^{13} and each Z^{14} independently represent a hydrogen atom, a C_1-C_6 alkyl group or a bond to a silicon atom of another monomer; preferably wherein M^2 is Al or B and each Z^{13} and each Z^{14} independently represent a hydrogen atom, a C_1-C_4 alkyl group or a bond to a silicon atom of another monomer; and

(vi) a combination thereof.

3. The process of any one of the previous claims, wherein one or more of the following are satisfied:

(i) the organosilica material support has a total surface area of 500 m^2/g to 2000 m^2/g;

(ii) the organosilica material support has a pore volume of 0.5 cm^3/g to 3.0 cm^3/g; and

(iii) the organosilica material support has an average pore diameter of 2.5 nm to 5 nm.

4. The process of any one of the previous claims, wherein the at least one catalyst metal is selected from the group consisting of Pt, Pd, Ir, Rh, Ru, Os and a combination thereof; and the at least one catalyst metal is present in an amount ranging from 0.1 to 2.0 wt. %.

5. The process of any one of the previous claims, wherein the hydrogenation catalyst further comprises a binder material selected from the group consisting of active and inactive materials, inorganic materials, clays, alumina, silica, silica-alumina, titania, zirconia, yttrium oxide, tantalum oxide, niobium oxide, activated carbon, ceramics, pumice, celite and a combination thereof.

6. The process of any one of the previous claims, wherein one or more of the following are satisfied:

(i) the hydrocarbon feedstream is a hydrocarbon fluid, a diesel boiling range feedstream, a lube oil boiling range feedstream, a whole or reduced petroleum crude, atmospheric residua, vacuum residua, propane deasphalted residua, dewaxed oil, slack wax, raffinate, or a mixture thereof;

(ii) the hydrocarbon feedstream contains up to 0.2 wt. % of nitrogen, up to 3.0 wt. % of sulfur, and up to 50 wt. % aromatics, all based on the hydrocarbon feedstream; and

(iii) the hydrocarbon feedstream has a sulfur content below 100 wppm.

7. A method of making a hydrogenation catalyst for aromatic hydrogenation, the method comprising:

a) providing an aqueous mixture that contains essentially no structure directing agent or porogen and includes a base and/or an acid,

(b) adding at least one compound of Formula $[Z^{15}Z^{16}SiCH_2]_3$ (VII) into the aqueous mixture to form a solution, wherein each Z^{15} represents a C_1-C_4 alkoxy group and each Z^{16} represents a C_1-C_4 alkoxy group;

(c) aging the solution to produce a pre-product;

(d) drying the pre-product to obtain an organosilica material support which is a polymer comprising independent units of a monomer of Formula $[Z^1OZ^2OSiCH_2]_3$ (I), wherein each Z^1 and Z^2 independently represent a hydrogen atom, a C_1-C_4 alkyl group or a bond to a silicon atom of another monomer, wherein the organosilica material support has an X-ray diffraction pattern with no peaks in the range of from 3 to 10 degrees 2θ; and

(e) impregnating the organosilica material support with at least one catalyst metal selected from the group consisting of a Group 8 metal, a Group 9 metal, a Group 10 metal and a combination thereof.

8. The method of claim 7, wherein the at least one compound of Formula (VII) is 1,1,3,3,5,5-hexaethoxy-1,3,5-trisilacyclohexane, and wherein each Z^1 and Z^2 independently represent a hydrogen atom, ethyl, or a bond to a silicon atom of another monomer.

9. The method of claim 7 or 8, further comprising grafting aluminum on the organosilica material support surface prior to impregnating the organosilica material support or adding to the aqueous mixture at least one compound selected from the group consisting of

(i) a further compound of Formula (VII); preferably wherein the at least one compound is a further compound of Formula (VII): 1,3,5-trimethyl-1,3,5-triethoxy-1,3,5-trisilacyclohexane;

(ii) a compound of Formula $Z^{17}OZ^{18}Z^{19}Z^{20}Si$ (VIII), wherein each Z^{17} represents a C_1-C_6 alkyl group, and Z^{18}, Z^{19} and Z^{20} are each independently selected from the group consisting of a C_1-C_6 alkyl group, a C_1-C_6 alkoxy group, a nitrogen-containing C_1-C_{10} alkyl group, a nitrogen-containing heteroaralkyl group, and a nitrogen-containing optionally substituted heterocycloalkyl group; preferably wherein

the at least one compound of Formula (VIII) is selected from selected from the group consisting of tetraethyl orthosilicate, methyltriethoxysilane, (N,N-dimethyl-aminopropyl)trimethoxysilane, N-(2-aminoethyl)-3-aminopropyltriethoxysilane,

4-methyl-1-(3-triethoxysilylpropyl)-piperazine, 4-(2-(triethoxysily)ethyl)pyridine, 1-(3-(triethoxysilyl)propyl)-4,5-dihydro-1H-imidazole, and (3-aminopropyl)triethoxysilane;

(iii) a compound of Formula $Z^{21}Z^{22}Z^{23}Si\text{-}R^1\text{-}Si\ Z^{21}Z^{23}Z^{24}$ (IX), wherein each Z^{21} independently represents a C_1-C_4 alkoxy group; each Z^{22} and Z^{23} independently represent a C_1-C_4 alkoxy group or a C_1-C_4 alkyl group; and R^1 is selected from the group consisting a C_1-C_8 alkylene group, a C_2-C_8 alkenylene group, a C_2-C_8 alkynylene group, a nitrogen-containing C_1-C_{10} alkylene group, an optionally substituted C_6-C_{20} aralkyl and an optionally substituted C_4-C_{20} heterocycloalkyl group; preferably wherein the at least one compound of Formula (IX) is selected from the group consisting of 1,2-bis(methyldiethoxysilyl)ethane, bis(triethoxysilyl)methane, 1,2-bis(triethoxysilyl)ethylene, N,N'-bis[(3-trimethoxysilyl)propyl]ethylenediamine, bis[(methyldiethoxysilyl)propyl]amine, and bis[(methyldimethoxysilyl)propyl]-N-methylamine;

(iv) a source of a trivalent metal oxide; preferably wherein the at least one source of trivalent metal oxide is selected from the group consisting of aluminum trimethoxide, aluminum triethoxide, aluminum isopropoxide, and aluminum-tri-sec-butoxide; and

(v) a combination thereof.

10. The method of any one of claims 7-9, wherein the aqueous mixture comprises ammonium hydroxide or a metal hydroxide, and has a pH from 8 to 14; or wherein the aqueous mixture comprises hydrochloric acid, and has a pH from 0.01 to 6.0.

11. The method of any one of claims 7-10, wherein the solution is aged in step (c) for up to 144 hours at a temperature of 50°C to 200°C or wherein the pre-product is dried at a temperature of 70°C to 200°C.

12. The method of any one of claims 7-11, wherein the at least one catalyst metal is selected from the group consisting of Pt, Pd, Ir, Rh, Ru, Os and a combination thereof;

preferably wherein the method further comprises adding a binder material selected from the group consisting of active and inactive materials, inorganic materials, clays, alumina, silica, silica-alumina, titania, zirconia, yttrium oxide, tantalum oxide, niobium oxide, activated carbon, ceramics, pumice, celite and a combination thereof; more preferably wherein the binder material is selected from the group consisting of silica-alumina, alumina, silica, titania, zirconia and activated carbon.

13. A hydrogenation catalyst for aromatic hydrogenation comprising:

(i) an organosilica material support, which is a polymer comprising independent units of a monomer of Formula $[Z^1OZ^2OSiCH_2]_3$ (I), wherein each Z^1 and Z^2 independently represent a hydrogen atom, a C_1-C_4 alkyl group or a bond to a silicon atom of another monomer, wherein the organosilica material support has an X-ray diffraction pattern with no peaks in the range of from 3 to 10 degrees 2θ; and

(ii) at least one catalyst metal selected from the group consisting of a Group 8 metal, a Group 9 metal, a Group 10 metal and a combination thereof.

14. The hydrogenation catalyst of claim 13, wherein the organosilica material support further comprises at least one other monomer selected from the group consisting of:

(i) an independent unit of Formula $[Z^3OZ^4SiCH_2]_3$ (II), wherein each Z^3 represents a hydrogen atom, a C_1-C_4 alkyl group or a bond to a silicon atom of another monomer and each Z^4 represents a C_1-C_6 alkyl group;

(ii) an independent unit of Formula $Z^5OZ^6Z^7Z^8Si$ (III), wherein each Z^5 represents a hydrogen atom or a C_1-C_4 alkyl group or a bond to a silicon atom of another monomer; and Z^6, Z^7 and Z^8 are each independently selected from the group consisting of a hydroxyl group, a C_1-C_4 alkyl group, a C_1-C_4 alkoxy group, a nitrogen-containing C_1-C_{10} alkyl group, a nitrogen-containing heteroalkyl group, a nitrogen-containing optionally substituted heterocycloalkyl group and an oxygen atom bonded to a silicon atom of another monomer;

(iii) an independent unit of Formula $Z^9Z^{10}Z^{11}Si\text{-}R\text{-}SiZ^9Z^{10}Z^{11}$ (IV), wherein each Z^9 independently represents a hydroxyl group, a C_1-C_4 alkoxy group or an oxygen bonded to a silicon atom of another comonomer; each Z^{10} and Z^{11} independently represent a hydroxyl group, a C_1-C_4 alkoxy group, a C_1-C_4 alkyl group or an oxygen

bonded to a silicon atom of another monomer; and R is selected from the group consisting a C_1-C_8 alkylene group, a C_2-C_8 alkenylene group, a C_2-C_8 alkynylene group, a nitrogen-containing C_1-C_{10} alkylene group, an optionally substituted C_6-C_{20} aralkyl and an optionally substituted C_4-C_{20} heterocycloalkyl group;

(iv) an independent unit of Formula $M^1(OZ^{12})_3$ (V), wherein M^1 represents a Group 13 metal and each Z^{12} independently represents a hydrogen atom, a C_1-C_6 alkyl or a bond to a silicon atom of another monomer;

(v) an independent unit of Formula $(Z^{13}O)_2M^2$-O-Si$(OZ^{14})_3$ (VI) , wherein M^2 represents a Group 13 metal and each Z^{13} and eachZ^{14} independently represent a hydrogen atom, a C_1-C_6 alkyl group or a bond to a silicon atom of another monomer; and

(vi) a combination thereof.

15. The hydrogenation catalyst of claim 13 or 14, wherein aluminum is grafted on the organosilica material support surface.