CLAIMS

What is claimed is:

1. A process for producing cyclohexylbenzene, the process comprising:

(a) feeding benzene and hydrogen to at least one reaction zone comprising a catalyst system, said catalyst system comprising a MCM-22 family molecular sieve and at least one hydrogenation metal, said MCM-22 family molecular sieve having an X-ray diffraction pattern including d-spacing maxima at 12.4±0.25, 6.9±0.15, 3.57±0.07 and 3.42±0.07 Angstrom;

(b) selecting hydroalkylation conditions for said at least one reaction zone to produce a hydroalkylation conversion in a range of from about 15% to about 75% wherein said hydroalkylation conditions include a hydroalkylation temperature within the range of from ~~about~~ 125°C to ~~about~~ 175°C and a hydroalkylation pressure within the range of from ~~about~~ 125 psig (862 kPag) to ~~about~~ 175 psig (1227 kPag); and

(c) contacting said benzene and said hydrogen in said reaction zone wherein the ratio of the total number of moles of hydrogen fed to the at least one reaction zone to the total number of moles of benzene fed to the at least one reaction zone is from ~~about 0.35~~ 0.45 to ~~about 1.35~~ 0.95.

2. The process of claim 1, wherein the selectivity to cyclohexylbenzene is in a range of from ~~about~~ 45% to ~~about~~ 85%.

3. The process of any preceding claim, wherein said hydroalkylation conditions of temperature is in the range of from ~~about~~ 135°C to ~~about~~ 165°C.

4. The process of any preceding claim, wherein said hydroalkylation conditions of pressure is in the range of from ~~about~~ 931 kPag to ~~about~~ 1138 kPa-a.

5. The process of any preceding claim, wherein said hydroalkylation conditions include a weight hourly space velocity in the range of from ~~about~~ 0.26 hr^{-1} to less than ~~about~~ 1.35 hr^{-1}.

6. The process of claim 1, wherein said MCM-22 family molecular sieve is selected from the group consisting of MCM-22, PSH-3, SSZ-25, ERB-1, ITQ-1, ITQ-2, MCM-36, MCM-49, MCM-56, UZM-8 and combinations of any two or more thereof.

7. The process of claim 1, wherein said at least one hydrogenation metal is selected from the group consisting of palladium, ruthenium, nickel, zinc, tin, cobalt, and combinations of any two or more thereof.

8. The process of any preceding claim, wherein said molecular sieve is MCM-49 and said at least one hydrogenation metal is palladium.

9. The process of any preceding claim, wherein said at least one hydrogenation metal is present in an amount from ~~about~~ 0.05% to ~~about~~ 10% by weight of the catalyst system.

10. The process of any preceding claim, wherein said benzene is passed through a reactive guard bed to remove at least a portion of reactive impurities, said reactive impurities comprising nitrogen compounds.

11. The process of any preceding claim, wherein said portion of the hydrogenation metal is supported on an inorganic oxide different from the molecular sieve.

12. The process of claim 11, wherein said inorganic oxide comprises an oxide of at least one element of Groups 2, 4, 13 and 14 of the Periodic Table of Elements.

13. The process of claim 11 or 12, wherein said inorganic oxide is selected from the group consisting of alumina, titania, zirconia and combinations of two or more thereof.

14. The process of any preceding claim, wherein said effluent further comprises dicyclohexylbenzene and at least part of the dicyclohexylbenzene is contacted with additional benzene under transalkylation conditions to produce addition cyclohexylbenzene.

15. The process of any preceding claim, wherein the benzene conversion is in the range of from ~~about~~ 30% to ~~about~~ 60%.

16. The method of any preceding claim, further comprising the step of selecting a ratio of the total number of moles of hydrogen fed to the at least one reaction zone to the total number of moles of benzene fed to the at least one reaction zone in a range of from ~~about~~ 0.55 to ~~about~~ 0.75, to produce said hydroalkylation conversion.

17. The method of any preceding claim, wherein said hydroalkylation conditions of temperature is in the range of from about 145°C to about 155°C, said hydroalkylation conditions of pressure is in the range of from ~~about~~ 931 kPag to ~~about~~ 1138 kPag.

18. The process of any preceding claim, wherein said MCM-22 family molecular sieve is selected from the group consisting of MCM-22, PSH-3, SSZ-25, ERB-1, ITQ-1, ITQ-2, MCM-36, MCM-49, MCM-56, UZM-8 and combinations of any two or more thereof, and said at least one hydrogenation metal is selected from the group consisting of palladium, ruthenium, nickel, zinc, tin, cobalt, and combinations of any two or more thereof.

19. The process of any preceding claim, wherein said at least one reaction zone is a fixed bed reactor.

20. A method for coproducing phenol and cyclohexanone, the method comprising the steps of producing cyclohexylbenzene by the process of any preceding claim, oxidizing the cyclohexylbenzene to produce cyclohexylbenzene hydroperoxide and cleaving the cyclohexylbenzene hydroperoxide to produce phenol and cyclohexanone.