CLAIMS

1. A hydrogenation process comprising:

(A) contacting a composition having:

(i) greater than about 50 wt% of cyclohexylbenzene, the wt% based upon total weight of the composition; and

(ii) a hydrogenable component comprising cyclohexenylbenzene;

with hydrogen in the presence of a hydrogenation catalyst under hydrogenation conditions.

2. The process of claim 1, wherein the hydrogenable component ~~has~~ further comprises a compound having at least one of an unsaturated double bond, a hydroxyl group, and a carbonyl group.

~~3. The process of claim 1 or claim 2, wherein the hydrogenable component is an olefin.~~

~~4. The process of claim 3, wherein the olefin is cyclohexene, a C8+ olefin oligomer, cyclopentene, cyclohexenylbenzene or phenyl methyl cyclopentene.~~

~~5.~~3. The process of claim 1 or claim 2, wherein the hydrogenable component ~~is~~ further comprises phenol.

~~6.~~4. The process of claim ~~5~~ 3, wherein the contacting converts at least a portion of the phenol to cyclohexanone and/or cyclohexanol.

~~7.~~5. The process of claim 1 or claim 2, wherein the hydrogenable component ~~is~~ comprises a ketone.

~~8.~~6. The process of claim ~~7~~ 5, wherein the ketone is phenylcyclohexanone.

~~9.~~7. The process of any ~~of the~~ preceding claim~~s~~, wherein the composition

has greater than about 1 wt% of the hydrogenable component, the wt% based upon total weight of the composition.

~~10.~~8. The process of any preceding claim, wherein the contacting produces a second composition comprising less than about 1 wt% of the hydrogenable component, the wt% based upon the total weight of the second composition.

~~11.~~9. The process of any ~~of the~~ preceding claims, wherein the conversion of the hydrogenable component is at least 50% more selective to cyclohexylbenzene than to bicyclohexane.

~~12.~~10. The process of any preceding claim, wherein the contacting produces a second composition comprising less than 0.5 wt% of bicyclohexane, the wt % based upon total weight of the second composition.

~~13.~~11. The process of any ~~of the~~ preceding claims, wherein the hydrogenation conditions comprise a temperature of about 40°C to about 80°C.

~~14.~~12. The process of claim ~~13~~ 11, wherein the hydrogenation conditions comprise a temperature of about 65°C.

~~15.~~13. The process of any ~~of the~~ preceding claims, wherein the hydrogenation conditions comprise a pressure of about 750 kPa,g to 1500 kPa,g.

~~16.~~14. The process of any preceding claim, wherein the hydrogenation catalyst comprises a hydrogenation component and a support.

~~17.~~15. The process of claim ~~16~~ 14, wherein the hydrogenation component comprises at least one metal component selected from Groups 6 to 10 of the Periodic Table of Elements.

~~18.~~16. The process of claim ~~16~~ 14, wherein the hydrogenation component comprises

palladium.

~~19.~~17. The process of any of claims ~~16~~ 14 to ~~18~~ 16, wherein the hydrogenation catalyst comprises about 0.1 to about 10 wt% of the hydrogenation component, the wt% based upon total weight of the hydrogenation catalyst.

~~20.~~18. A process for producing phenol comprising:

(a) hydroalkylating benzene to form a composition having: (i) cyclohexylbenzene; and (ii) a first hydrogenable component comprising cyclohexenylbenzene;

(b) hydrogenating at least a portion of the first hydrogenable component;

(c) oxidizing the cyclohexylbenzene to form an oxidized composition comprising a hydroperoxide; and

(d) cleaving the hydroperoxide to form at least some phenol and cyclohexanone.

~~21.~~19. The process of claim ~~20~~ 18, wherein the cleaving step (d) forms a second hydrogenable component comprising ~~at least one of an olefin, a ketone and phenol~~ cyclohexenylbenzene.

~~22. The process of claim 21, wherein the first hydrogenable component and the second hydrogenable component are the same or different.~~

~~23.~~20. The process of claim ~~21~~ 19, further comprising:

(e) hydrogenating at least a portion of the second hydrogenable component.

~~24.~~21. The process of claim ~~23~~ 20, wherein hydrogenating step (b) and hydrogenating step (e) are conducted in the same reactor.

~~25. The process of any of claims 20-25, further comprising:~~

~~(f) dehydrogenating at least a portion of the cyclohexanone to form~~

~~phenol.~~

22. The process of claim 18, wherein at least a portion of the cylcohexenylbenzene is converted into cyclohexylbenzene in step (b).

23. The process of claim 18, wherein the cleaving step (d) comprises:

(d1) obtaining a cleavage effluent comprising cyclohexylbenzene, phenol, cyclohexanone and cyclohexenylbenzene;

(d2) separating at least a portion of the cyclohexylbenzene and cyclohexenylbenzene from the cleavage effluent to obtain a recycle cyclohexylbenzene stream comprising cyclohexenylbenzene and at least 50 wt% of cyclohexylbenzene;

and the process further comprises:

(e) hydrogenating at least a portion of the recycle cyclohexylbenzene stream such that at least a portion of the cyclohexenylbenzene is converted to cyclohexylbenzene; and

(f) recycling at least a portion of the hydrogenated recycle cyclohexylbenzene stream to step (c).

24. The process of claim 23, wherein the recycle cyclohexylbenzene stream further comprises phenol, and in step (e), at least a portion of the phenol contained in the recycle cyclohexylbenzene stream is converted to cyclohexanol.

25. The process of claim 1, wherein in step (ii), at least a portion of the cyclohexenylbenzene is converted to cyclohexylbenzene.

26. The process of claim 1, further comprising the following step (B) after step (A):

(B) oxidizing the composition such that at least a portion of the cyclohexylbenzene contained in the composition is converted to cyclohexylbenzene hydroperoxide.