CLAIMS

1. A process for producing phenol and cyclohexanone, the process comprising:

(a) contacting a feed comprising cyclohexylbenzene hydroperoxide with a cleavage catalyst comprising an aluminosilicate zeolite of the FAU type having a unit cell size less than 24.50 Å under cleavage conditions effective to convert at least part of the cyclohexylbenzene hydroperoxide into phenol and cyclohexanone.

2. The process of claim 1, wherein the feed comprises greater than 1 wt% of cyclohexylbenzene hydroperoxide, based upon total weight of the feed.

3. The process of any one of the preceding claims, wherein the feed comprises greater than 50 wt% of cyclohexylbenzene, based upon total weight of the feed.

4. The process of claim 1, wherein the conversion of the cyclohexylbenzene hydroperoxide in the contacting step (a) is greater than 30%.

5. The process of any one of the preceding claims, wherein the FAU type zeolite has a unit cell size less than or equal to 24.35 Å.

6. The process of claim 1, wherein the cleavage catalyst is substantially metal-free.

7. The process of any one of the preceding claims, wherein at least a portion of the cleavage catalyst is contained in a fixed bed.

8. The process of any one of the preceding claims, wherein the cleavage conditions include a temperature of about 20°C to about 200°C and a pressure of about 100 kPa, gauge to about 2000 kPa, gauge.

9. The process of any one of the preceding claims, wherein the contacting step (a) is conducted in at least a first reactor and a second reactor connected in series.

10. The process of any one of the preceding claims, wherein the cleavage catalyst has a pore volume of greater than 0.3 cc/g.

11. The process of any one of the preceding claims, wherein the phenol is converted to at least one of a phenolic resin, bisphenol A, ε-caprolactam, an adipic acid or a plasticizer.

12. The process of any one of the preceding claims, wherein the cyclohexanone is converted into at least one of adipic acid, a cyclohexanone resin, a cyclohexanone oxime, caprolactam, or nylon.

13. The process of any one of the preceding claims, wherein the catalyst is rejuvenated or regenerated in a first reactor during operation of the contacting step (a) in a second reactor, and the first reactor and the second reactor are connected in parallel.

14. The process of any one of the preceding claims, wherein the contacting step (a) is at least partly conducted in a slurry reactor.

15. The process of any one of the preceding claims, wherein at least a portion of the cleavage catalyst is continuously or periodically withdrawn downstream of the contacting step (a) and rejuvenated.

16. The process of claim 15, wherein the cleavage catalyst is rejuvenated by flushing with a polar solvent.

17. The process of claim 16, wherein the polar solvent is acetone or cyclohexanone.

18. The process of claim 15 or claim 16, wherein at least a portion of the rejuvenated cleavage catalyst is returned to the contacting step (a).

19. The process of any one of the preceding claims, and further comprising:

(i) contacting cyclohexylbenzene with an oxygen-containing compound in the presence of an oxidation catalyst comprising a cyclic imide under oxidation conditions effective to produce an oxidation product comprising cyclohexylbenzene hydroperoxide and cyclic imide catalyst; and

(ii) supplying at least a portion of the oxidation product comprising cyclohexylbenzene hydroperoxide to the contacting step (a).

20. The process of claim 19, wherein at least a portion of the cyclic imide catalyst is removed from the oxidation product supplied to the contacting step (a).

21. The process of claim 19 or claim 20, wherein at least a portion of the cyclic imide catalyst is removed from the oxidation product by selective adsorption with an aluminosilicate zeolite of the FAU type having a unit cell size less than 24.35 Å.

22. The process of claim 20, wherein removal of the cyclic imide catalyst from the oxidation product is conducted simultaneously with the contacting step (a).

23. The process of claim 22, wherein at least a portion of the cyclic imide catalyst is desorbed from the aluminosilicate zeolite and recycled to the contacting step (i).

24. The process of any one of the preceding claims, wherein the feed comprises greater than 0.5 wt% of a polar solvent, based upon total weight of the feed.

25. ~~A process for producing phenol~~ The process of any one of claims 19-23, the process further comprising, prior to the contacting (i):

~~(a)~~ hydroalkylating benzene with hydrogen in the presence of a hydroalkylation catalyst under conditions effective to produce a hydroalkylation reaction product comprising cyclohexylbenzene;

~~(b)~~ separating at least a portion of the cyclohexylbenzene from the hydroalkylation reaction product; and

supplying at least a portion of the separated cyclohexylbenzene to the contacting (i).

(c) contacting at least a portion of the cyclohexylbenzene from the separating step (b) with an oxygen-containing compound in the presence of an oxidation catalyst comprising a cyclic imide under oxidation conditions effective to produce an oxidation product comprising cyclohexylbenzene hydroperoxide and cyclic imide catalyst; and

(d) contacting at least a portion of the oxidation product comprising cyclohexylbenzene hydroperoxide with a cleavage catalyst comprising an aluminosilicate zeolite of the FAU type having a unit cell size less than 24.50 Å under cleavage conditions effective to convert at least part of the cyclohexylbenzene hydroperoxide into phenol and cyclohexanone.