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~~ 24.35 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.~~5. The process of claim 1, wherein the cleavage catalyst is substantially metal-free.

~~7.~~6. 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.~~7. 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.~~8. 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.~~9. 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.~~10. 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.~~11. 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.~~12. 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.~~13. The process of any one of the preceding claims, wherein the contacting step (a) is at least partly conducted in a slurry reactor.

~~15.~~14. 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.~~15. The process of claim ~~15~~ 14, wherein the cleavage catalyst is rejuvenated by flushing with a polar solvent.

~~17.~~16. The process of claim ~~16~~ 15, wherein the polar solvent is acetone or cyclohexanone.

~~18.~~17. The process of claim ~~15~~ 14 or claim ~~16~~ 15, wherein at least a portion of the rejuvenated cleavage catalyst is returned to the contacting step (a).

~~19.~~18. 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.~~19. The process of claim ~~19~~ 18, wherein at least a portion of the cyclic imide catalyst is removed from the oxidation product supplied to the contacting step (a).

~~21.~~20. The process of claim ~~19~~ 18 or claim ~~20~~ 19, 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.~~21. The process of claim ~~20~~ 19, wherein removal of the cyclic imide catalyst from the oxidation product is conducted simultaneously with the contacting step (a).

~~23.~~22. The process of claim ~~22~~ 21, wherein at least a portion of the cyclic imide catalyst is desorbed from the aluminosilicate zeolite and recycled to the contacting step (i).

~~24.~~23. 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.~~24. The process of any one of claims ~~19-23~~ 18-22, the process further comprising, prior to the contacting (i):

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

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).