CLAIMS

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

(a) supplying a cleavage feed comprising cyclohexylbenzene hydroperoxide to a cleavage reaction zone;

(b) contacting a cleavage reaction mixture comprising the cleavage feed in the cleavage reaction zone with a solid acid catalyst under conditions effective to produce a cleavage effluent comprising phenol and cyclohexanone, wherein the cleavage reaction mixture further comprises from 20 wt% to 40 wt% phenol;

(c) dividing the cleavage effluent into at least a cleavage product and a cleavage recycle; and

(d) supplying the cleavage recycle and a polar solvent to the cleavage reaction zone to produce the cleavage reaction mixture with the cleavage feed.

2. The process of claim 1, wherein the polar solvent is supplied to the cleavage reaction zone in (d) in an amount from 100 ppm to 10% by weight of the cleavage reaction mixture.

3. The process of claim 1 or claim 2, wherein the polar solvent is supplied to the cleavage reaction zone in (d) in an amount from 1000 ppm to 5% by weight of the cleavage reaction mixture.

4. The process of any preceding claim, wherein the polar solvent is water.

5. The process of any preceding claim, wherein the cleavage effluent comprises unreacted cyclohexylbenzene hydroperoxide.

6. The process of any preceding claim, wherein at least part of the polar solvent is combined with the cleavage recycle to produce a combined stream which is supplied to the cleavage reaction zone in (d).

7. The process of any preceding claim, wherein the solid acid catalyst comprises an acidic molecular sieve.

8. The process of claim 7, wherein the acidic molecular sieve comprises an aluminosilicate zeolite.

9. The process of claim 7 or claim 8, wherein the acidic molecular sieve comprises at least one of zeolite beta, faujasite, ZSM-12, mordenite and an MCM-22 family molecular sieve.

10. The process of any one of claims 7 to 9, wherein the acidic molecular sieve comprises faujasite.

11. The process of any one of claims 7 to 10, wherein the acidic molecular sieve comprises faujasite having a unit cell size of less than 24.50 Å.

12. The process of any preceding claim, wherein the conditions in (b) include a temperature from about 20°C to about 200°C and an absolute pressure from about 100 kPa to about 2000 kPa.

13. A process for producing phenol and/or cyclohexanone, the process comprising:

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

(b) contacting at least a portion of the cyclohexylbenzene from the hydroalkylation reaction product with oxygen in the presence of an oxidation catalyst under oxidation conditions effective to produce an oxidation product comprising cyclohexylbenzene hydroperoxide;

(c) supplying at least a portion of the oxidation product comprising cyclohexylbenzene hydroperoxide to a cleavage reaction zone;

(d) contacting a cleavage reaction mixture comprising the said oxidation product portion in the cleavage reaction zone with a solid acid catalyst under conditions effective to produce a cleavage effluent comprising phenol and cyclohexanone, wherein the cleavage reaction mixture further comprises from 20 wt% to 40 wt% phenol;

(e) dividing the cleavage effluent into at least a cleavage product and a cleavage recycle; and

(f) supplying the cleavage recycle and a polar solvent to the cleavage reaction zone to produce the cleavage reaction mixture with said oxidation product portion.

14. The process of claim 13, wherein the polar solvent is supplied to the cleavage reaction zone in (f) in an amount such that the cleavage reaction mixture comprises from 100 ppm to 10% by weight of the polar solvent.

15. The process of claim 13 or claim 14, wherein the polar solvent is supplied to the cleavage reaction zone in (f) in an amount such that the cleavage reaction mixture comprises from 1000 ppm to 5% by weight of the polar solvent.

16. The process of any one of claims 13 to 15, wherein the polar solvent is water.

17. The process of any one of claims 13 to 16, wherein the cleavage effluent comprises unreacted cyclohexylbenzene hydroperoxide.

18. The process of any one of claims 13 to 17, wherein at least part of the polar solvent is combined with the cleavage recycle to produce a combined stream which is supplied to the cleavage reaction zone in (f).

19. The process of any one of claims 13 to 18, wherein the solid acid catalyst comprises an acidic molecular sieve.

20. The process of claim 19, wherein the acidic molecular sieve comprises an aluminosilicate zeolite.

21. The process of claim 19 or claim 20, wherein the acidic molecular sieve comprises at least one of zeolite beta, faujasite, ZSM-12, mordenite and an MCM-22 family molecular sieve.

22. The process of any one of claims 19 to 21, wherein the acidic molecular sieve comprises faujasite.

23. The process of any one of claims 19 to 22, wherein the acidic molecular sieve comprises faujasite having a unit cell size of less than 24.50 Å.

24. The process of any one of claims 13 to 23, wherein the conditions in (b) include a temperature from about 20°C to about 200°C and a pressure from about 100 kPa to about 2000 kPa.