CLAIMS

1. A process for producing one or both of phenol and cyclohexanone, the process comprising:

(a) oxidizing at least a portion of a feed comprising cyclohexylbenzene to produce an oxidation composition comprising cyclohexyl-1-phenyl-1-hydroperoxide;

(b) cleaving at least a portion of the oxidation composition to produce a single-phase cleavage reaction mixture comprising phenol, cyclohexanone and at least one contaminant; and

(c) contacting at least a portion of the single-phase cleavage reaction mixture with a basic material to convert at least a portion of the contaminant to a converted contaminant, thereby producing a single-phase modified reaction mixture.

2. The process of claim 1, wherein the contaminant is one or more of an acyclic aliphatic hexanal, an acyclic aliphatic hexanone, a cyclohexenone, a cyclohexyldione, a hydroxycyclohexanone, benzoic acid, a benzoic ester, a cyclohexenyl cyclohexanone, a methylcyclopentenyl cyclohexanone, 1-phenyl-6-hydroxyhexan-1-one, 1-cyclohexyl-6-hydroxyhexan-1-one and a bicyclic twelve carbon hydroperoxide.

3. The process of claim 1 or 2, wherein the basic material is one or more of ~~an alkali metal hydroxide, an alkali earth metal hydroxide, an alkali metal acetate, an alkali earth metal acetate, an alkali metal carbonate, an alkali earth metal carbonate, an alkali metal bicarbonate, an alkali earth metal bicarbonate, ammonia, a basic clay,~~ an anionic exchange resin, an activated carbon, and an amine.

4. The process of any one of the preceding claims, wherein the basic material is a primary, secondary or tertiary amine.

5. The process of any one of claims 1-3, wherein the basic material is a diamine.

6. The process of any one of the preceding claims, wherein the basic material is

an aliphatic amine.

~~6. The process of any one of the preceding claims, wherein the contacting (c) is conducted at a temperature of about 30°C to about 250°C and a pressure of about 5 to about 3450 kPa.~~

7. The process of claim 6, wherein the contacting (c) is conducted at a temperature of ~~about~~ 60°C to ~~about~~ 160°C and a pressure of ~~about~~ 170 to ~~about~~ 1380 kPa.

8. The process of any one of the preceding claims, wherein the contaminant is formed during the oxidizing (a).

9. The process of any one of the preceding claims, wherein the contaminant is formed during the cleaving (b).

10. The process of any one of the preceding claims, wherein the cyclohexylbenzene is produced by contacting benzene with hydrogen in the presence of a bifunctional catalyst.

11. The process of claim 10, wherein the bifunctional catalyst is a zeolite of the MCM-22 family containing at least one metal selected from palladium, ruthenium, nickel, zinc, tin and cobalt.

12. The process of claim 10 or claim 11, wherein the contaminant is formed in the production of the cyclohexylbenzene and is provided with the feed comprising cyclohexylbenzene in (a).

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

heating at least a portion of the at least one contaminant upstream of the contacting (c) to a temperature of at least 100°C to produce a heat-treated cleavage reaction mixture comprising the at least one contaminant.

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

separating at least a portion of the modified reaction mixture into a first stream rich in at least one of cyclohexanone and phenol relative to the modified reaction product, and a second stream rich in the converted contaminant relative to the modified reaction product.

15. The process of claims 1-13, further comprising:

separating at least a portion of the cleavage reaction mixture upstream of the contacting (c) to provide a cyclohexanone-rich fraction containing at least a portion of the contaminants and providing the contaminants in the cyclohexanone-rich fraction to the contacting step (c).

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

separating at least a portion of the cleavage reaction mixture to provide at least a phenol-rich fraction containing at least a portion of the contaminants, and providing the contaminants in the phenol-rich fraction to the contacting step (c).

17. ~~Phenol~~ A phenol composition produced by the process of claim 1, wherein the phenol composition comprises phenol and a converted contaminant.

18. ~~Cyclohexanone~~ A cyclohexanone composition produced by the process of claim 1, wherein the cyclohexanone composition comprises cyclohexanone and a converted contaminant.

19. At least one of a phenolic resin, bisphenol A, ε-caprolactam, an adipic acid or a plasticizer produced from the phenol composition of claim 17.

20. At least one of adipic acid, a cyclohexanone resin, a cyclohexanone oxime, caprolactam or nylon produced from the cyclohexanone composition of claim 18.

21. A process for producing one or both of phenol and cyclohexnanone, the process comprising:

(a) contacting oxygen and a feed comprising cyclohexylbenzene to cause an oxidation reaction to occur and produce an oxidation composition comprising cyclohexyl-1-phenyl-1-hydroperoxide;

(b) contacting an acid catalyst with at least a portion of the oxidation composition to cause a cleavage reaction to occur, and produce a single-phase cleavage reaction mixture comprising phenol, cyclohexanone and at least one contaminant; and

(c) contacting a basic material with at least a portion of the single-phase cleavage reaction mixture to convert at least a portion of the contaminant to a converted contaminant, thereby producing a single-phase modified reaction mixture.

22. A process for producing one or both of phenol and cyclohexanone, the process comprising:

(a) oxidizing cyclohexylbenzene to produce an oxidation composition comprising cyclohexyl-1-phenyl-1-hydroperoxide;

(b) cleaving at least a portion of the cyclohexyl-1-phenyl-1-hydroperoxide to produce a single-phase cleavage reaction mixture comprising phenol, cyclohexanone and at least one contaminant; and

(c) contacting at least a portion of the contaminant with a basic material in the single phase to convert at least a portion of the contaminant to a converted contaminant, thereby producing a single-phase modified reaction mixture.