CLAIMS

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

(a) contacting benzene with a C_3 alkylating agent comprising isopropanol, and optionally propylene, under alkylation conditions such that at least part of said isopropanol and benzene react to produce cumene;

(b) oxidizing at least part of the cumene produced in (a) in the presence of an oxidizing gas to produce an oxidation effluent comprising cumene hydroperoxide and unreacted cumene and a spent oxidizing gas;

(c) treating at least part of the unreacted cumene from the oxidation effluent to remove nitrogenous impurities therefrom and produce a purified cumene stream;

(d) recycling the purified cumene stream to the oxidizing (b);

(e) cleaving at least part of the cumene hydroperoxide from the oxidation effluent to produce a cleavage effluent comprising phenol and acetone;

(f) recovering phenol from the cleavage effluent;

(g) hydrogenating at least part of the acetone from the cleavage effluent to produce isopropanol; and

(h) recycling at least part of the isopropanol from (g) to the contacting (a).

2. The process of claim 1, wherein said treating (c) includes passing at least part of the unreacted cumene through a solid adsorbent.

3. The process of claim 2, wherein said solid adsorbent comprises a molecular sieve or an acidic clay.

4. The process of ~~any preceding~~ claim 1, wherein at least part of the unreacted cumene from (b) is washed with an acidic aqueous solution prior to said treating (c).

5. The process of ~~any preceding~~ claim 1 and further comprising:

(i) vaporizing cumene in said oxidation effluent to separate the unreacted cumene from the oxidation effluent and produce a concentrated cumene hydroperoxide stream;

(j) feeding the concentrated cumene hydroperoxide stream to the cleaving (e); and

(k) washing the cumene separated in (i) with a caustic solution and feeding the washed cumene to the treating (c).

6. The process of ~~any preceding~~ claim 1 and further comprising:

(l) recovering unreacted cumene from said spent oxidizing gas; and

(m) washing the cumene recovered in (l) with a caustic solution and feeding the washed cumene to the treating (c).

7. The process of ~~any preceding~~ claim 1, wherein said recovering (f) comprises fractionating said cleavage effluent to produce an acetone-containing stream, a phenol containing stream and a further stream containing unreacted cumene.

8. The process of claim 7, wherein the unreacted cumene in said further stream is washed with a caustic solution and then fed to the treating (c).

9. The process of ~~any preceding~~ claim 1, wherein said contacting (a) takes place in the presence of a molecular sieve alkylation catalyst.

10. The process of claim 9, wherein said alkylation catalyst comprises at least one zeolite catalyst selected from the group ~~comprising~~ consisting of ZSM-3, ZSM-4, ZSM-5, ZSM-11, ZSM-12, ZSM-14, ZSM-18, ZSM-20, ZSM-22, ZSM-23, ZSM-35, ZSM-48, zeolite beta, zeolite Y, Ultrastable Y (USY), Dealuminized Y (Deal Y), mordenite, MCM-22, PSH-3, SSZ-25, ERB-1, ITQ-1, ITQ-2, MCM-36, MCM-49, MCM-56, and UZM-8.

11. The process of claim 9, wherein said alkylation catalyst comprises at least one zeolite catalyst selected from the group ~~comprising~~ consisting of MCM-22, PSH-3, SSZ-25, ERB-1, ITQ-1, ITQ-2, MCM-36, MCM-49, MCM-56, UZM-8, and mixtures thereof.

12. The process of ~~any preceding~~ claim 1, wherein said alkylation conditions comprise a temperature of 20°C to 350°C, a pressure of 100 kPa to 20,000 kPa, and a molar ratio of benzene to C_3 alkylating agent fed to said alkylation zone of 0.1:1 to 100:1.

13. The process of claim 12, wherein the molar ratio of benzene to C_3 alkylating agent fed to said alkylation zone ranges ~~between~~ from 0.3:1 to 10:1~~, preferably between 0.5:1 to 5:1, more preferably between 1:1 to 3:1~~.

14. The process of claim 12, wherein the temperature ranges ~~between~~ from 100 to 300°C~~, preferably between 150 to 280°C~~.

15. The process of ~~any preceding~~ claim 1, wherein said C_3 alkylating agent comprises a mixture of isopropanol and propylene at molar ratio of isopropanol to propylene of about 0.01:1 to about 100:1.

16. The process of claim 12, wherein the molar ratio of benzene to C_3 alkylating agent fed to said alkylation zone ranges from 0.5:1 to 5:1.

17. The process of claim 12, wherein the molar ratio of benzene to C_3 alkylating agent fed to said alkylation zone ranges from 1:1 to 3:1.

18. The process of claim 12, wherein the temperature ranges from 150 to 280°C.