CLAIMS

1. A process for oxidizing a feed comprising cyclohexylbenzene, the process comprising:

contacting the feed with oxygen and an oxidation catalyst which comprises a cyclic imide in a plurality of reaction zones connected in series, wherein the contacting in at least two of the plurality of reaction zones is conducted under conditions effective to oxidize a portion of the cyclohexylbenzene to cyclohexylbenzene hydroperoxide, and at least one of the plurality of reaction zones has a different reaction condition than another of the plurality of reaction zones;

wherein the different reaction conditions include a progressively decreasing temperature between adjacent reaction zones of at least 5°C and an increase in oxidation catalyst concentration in the feed from at least one of the plurality of reaction zones to the next of the plurality of reaction zones in the series.

2. The process of claim 1, wherein the plurality of reaction zones consists of three reaction zones.

3. The process of any one of the preceding claims, wherein the temperature in the first of the plurality of reaction zones in the series is 100°C to 120°C and the temperature in the last of the plurality of reaction zones in the series is 70°C to 90°C.

4. The process of any one of the preceding claims, wherein the increase in oxidation catalyst in the feed is at least 100 ppmw.

5. The process of any one of the preceding claims, wherein at least 100 ppmw of the oxidation catalyst is supplied to the first of the plurality of reaction zones in the series based upon total weight of the feed entering the reaction zone.

6. The process of any one of the preceding claims, wherein at least 500 ppmw of the oxidation catalyst is supplied to the last of the plurality of reaction zones in the series, based upon total weight of the feed entering the reaction zone.

7. The process of any one of the preceding claims, wherein at least one of the plurality of reaction zones comprises a continuous stirred-tank reactor (CSTR).

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

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

(ii) oxidizing a feed comprising at least a portion of the cyclohexylbenzene in accordance with the process of any preceding claims.

9. The process of claim 8, wherein there is at least one reaction zone connected in parallel with one or more of the plurality of reactors connected in series.