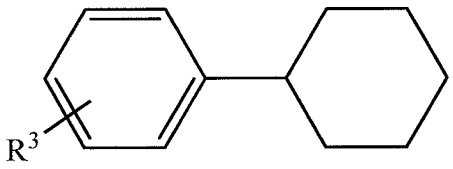
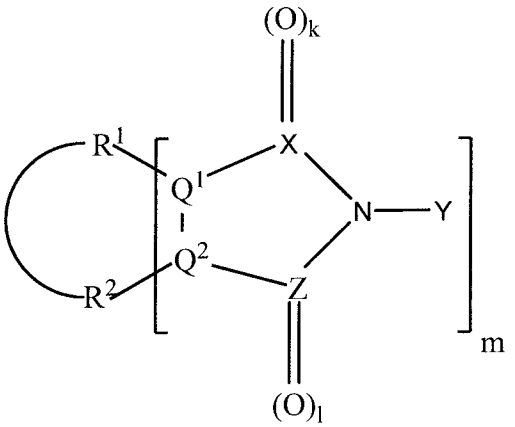
CLAIMS

1. A process for oxidizing an alkyaromatic compound to the corresponding alkyaromatic hydroperoxide, the process comprising contacting an alkylaromatic compound of general formula (I):



(I)

in which R^3 represents hydrogen, one or more alkyl groups having from 1 to 4 carbon atoms or a cyclohexyl group, with air in the presence of a catalyst comprising a cyclic imide of the general formula (II):



(II)

wherein each of R^1 and R^2 is independently selected from hydrocarbyl and substituted hydrocarbyl radicals having 1 to 20 carbon atoms, or from the groups SO_3H, NH_2, OH, and NO_2 or from the atoms H, F, Cl, Br, and I, provided that R^1 and R^2 can be linked to one another via a covalent bond;

each of Q^1 and Q^2 is independently selected from C, CH, CR^3;

each of X and Z is independently selected from C, S, CH_2, N, P and elements of Group 4 of the Periodic Table;

Y is O or OH;

k is 0, 1, or 2;

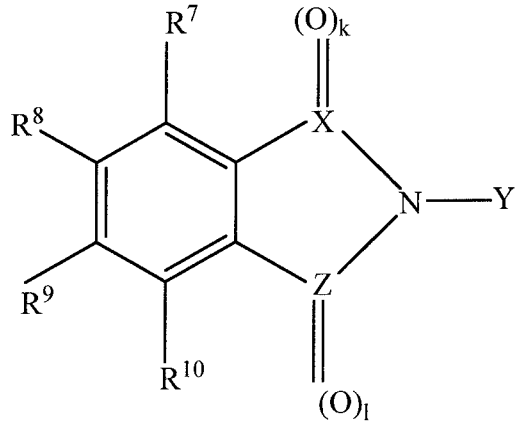
l is 0, 1, or 2;

m is 1 to 3; and

R^3 can be any of the entities listed for R^1; and

wherein said contacting is conducted at a temperature of about 90°C to about 150°C and a pressure of between about 15 kPa and about 500kPa, said cyclic imide is present in an amount between about 0.05 wt% and about 5 wt% of the alkylaromatic compound in said feed, and said catalyst is substantially free of alkali metal compounds, said contacting oxidizing at least part of the alkylaromatic compound in said feed to the corresponding alkylaromatic hydroperoxide.

2. The process of claim 1, wherein said cyclic imide obeys the general formula (II):



(II)

wherein each of R^7, R^8, R^9, and R^{10} is independently selected from hydrocarbyl and substituted hydrocarbyl radicals having 1 to 20 carbon atoms, or from the groups SO_3H, NH_2, OH, and NO_2 or from the atoms H, F, Cl, Br, and I,
each of X and Z is independently selected from C, S, CH_2, N, P and elements of Group 4 of the Periodic Table;
Y is O or OH,
k is 0, 1, or 2, and
l is 0, 1, or 2.

3. The process of claim 1, wherein said cyclic imide comprises N-hydroxyphthalimide.

4. The process of claim 1, wherein said contacting is conducted at a temperature of between about 125°C and about 140°C and a pressure of about 15kPa to about 150kPa.

5. The process of claim 1, wherein said cyclic imide is present in an amount between about 0.1 wt% and about 1 wt% of the alkylaromatic in said feed during said contacting.

6. The process of claim 1, wherein said cyclic imide is present in an amount between about 0.05 wt% and about 0.5 wt% of the alkylaromatic in said feed during said contacting.

7. The process of claim 1, wherein said contacting converts at least 4 wt% per hour conversion of said alkylaromatic compound with a selectivity to the corresponding alkylaromatic hydroperoxide of at least 90 wt%.

8. The process of claim 1, wherein said alkylaromatic compound is ~~selected from cumene, sec-butylbenzene, and~~ cyclohexylbenzene.

~~9. The process of claim 1, wherein said alkylaromatic compound is selected from sec-butylbenzene.~~

~~10. The process of claim 1, wherein said alkylaromatic compound is selected from cyclohexylbenzene.~~

~~11.~~9. The process of claim 1, further comprising the step of:
cleaving the alkylaromatic hydroperoxide to produce phenol and the corresponding ketone.

~~12.~~10. The process of claim ~~11~~ 9, wherein the cleaving is conducted in the presence of a catalyst.

~~13.~~11. The process of claim ~~11~~ 9, wherein the cleaving is conducted in the presence of a homogeneous catalyst.

~~14.~~12. The process of claim ~~13~~ 11 wherein said homogeneous catalyst comprises at least one of sulfuric acid, perchloric acid, phosphoric acid, hydrochloric acid, p-toluenesulfonic acid, ferric chloride, boron trifluoride, sulfur dioxide and sulfur trioxide.

~~15.~~13. The process of claim ~~11~~ 9, wherein the cleaving is conducted in the presence of a heterogeneous catalyst.

~~16.~~14. The process of claim ~~15~~ 13, wherein said heterogeneous catalyst comprises a smectite clay.

~~17.~~15. The process of claim ~~11~~ 9, wherein the cleaving is conducted at a temperature of about 40°C to about 120°C, a pressure of about 100 to about 1000 kPa, and a liquid hourly space velocity (LHSV) based on the hydroperoxide of about 1 to about 50 hr^{-1}.

16. The process of claim 1, wherein the air is subjected to water removal.