PCT CLAIMS

1. A process for the dehydrogenation of at least one dehydrogenatable hydrocarbon, the process comprising:

(a) supplying a dehydrogenation feed stream comprising at least one dehydrogenatable hydrocarbon to a first dehydrogenation reaction zone wherein the at least one dehydrogenatable hydrocarbon is an oxygen-containing six-membered carbon ring compound;

(b) supplying at least one stabilizing compound to the first dehydrogenation reaction zone, such that the weight ratio of the stabilizing compound to the dehydrogenatable hydrocarbon supplied to the first dehydrogenation reaction zone is in the range of from 1:200 to 200:1 wherein the stabilizing compound is ~~a non-oxygen-containing six membered carbon ring compound~~ cyclohexane; and

(c) contacting the at least one dehydrogenatable hydrocarbon and the at least one stabilizing compound with a first dehydrogenation catalyst in the first dehydrogenation reaction zone under dehydrogenation conditions to convert at least a portion of the dehydrogenatable hydrocarbon into an unsaturated six-membered carbon ring compound and hydrogen, and to convert at least a portion of the stabilizing compound to benzene.

2. The process of claim 1, wherein the weight ratio of the stabilizing compound to the dehydrogenatable hydrocarbon supplied to the first dehydrogenation reaction zone is in the range of from 1:100 to 10:1.

3. The process of claim 1, wherein the weight ratio of the stabilizing compound to the dehydrogenatable hydrocarbon supplied to the first dehydrogenation reaction zone in the range of from 1:200 to 1:1.

~~4. The process of any one of the preceding claims, wherein the at least one stabilizing compound is selected from cyclohexane, cyclohexene and benzene.~~

~~5.~~4. The process of any one of claims 1-3, wherein the at least ~~on~~ one stabilizing compound is cyclohexane.

6.5. The process of any one of claims 1-3, wherein the at least one stabilizing compound is benzene.

7.6. The process of any one of claims 1 to 6 1-5, wherein the at least one dehydrogenatable hydrocarbon is cyclohexanone and the unsaturated six-membered carbon ring compound is phenol.

8.7. The process of claim 7 6, wherein the dehydrogenation feed stream is produced by a process comprising:

(d) contacting benzene and hydrogen with a hydroalkylation catalyst under hydroalkylation conditions to produce a hydroalkylation reaction product stream comprising cyclohexylbenzene, cyclohexane, and benzene;

(e) oxidizing at least a portion of the cyclohexylbenzene from the hydroalkylation reaction product stream to produce cyclohexylbenzene hydroperoxide;

(f) cleaving at least a portion of the cyclohexylbenzene hydroperoxide from the oxidizing step (e) to produce a cleavage reaction product stream comprising phenol and cyclohexanone; and

(g) employing at least a portion of the cleavage reaction product stream as the dehydrogenation feed stream.

9.8. The process of claim 8 7, wherein the at least one stabilizing compound is obtained from the hydroalkylation reaction product stream.

10.9. The process of claim 8 7, and further comprising dividing at least a portion of the hydroalkylation reaction product stream into (i) a C_6-rich stream comprising cyclohexane and benzene; and (ii) a cyclohexylbenzene-rich stream.

11.10. The process of claim 10 9, and further comprising supplying at least a portion of the C_6-rich stream to the first dehydrogenation reaction zone such that the cyclohexane of the C_6-rich stream is as the at least one stabilizing compound.

12.11. The process of claim 10 9, wherein at least a portion of the cyclohexane in the C_6-rich stream is converted to benzene by produced in the contacting step (c) and at least a portion of the benzene is recycled to the contacting step (d).

~~13.~~12. The process of claim ~~10~~ 9, and further comprising supplying a further portion of the C_6-rich stream to a second dehydrogenation reaction zone and contacting the further portion of the C_6-rich stream with a second dehydrogenation catalyst in the second dehydrogenation reaction zone under dehydrogenation conditions to convert at least a portion of the cyclohexane into benzene and produce a second dehydrogenation product stream.

~~14.~~13. The process of claim ~~10~~ 12, and further comprising recycling at least a portion of the second dehydrogenation product stream back to the contacting step (d).

~~15.~~14. The process of claim ~~8~~ 7, wherein at least a portion of the cleavage reaction product stream is supplied without fractionation to the first dehydrogenation reaction zone as the dehydrogenation feed stream.

~~16.~~15. The process of claim ~~8~~ 7, and further comprising distilling at least a portion of the cleavage reaction product stream into (i) a first fraction comprising an azeotropic mixture of phenol and cyclohexanone; and (ii) a second fraction rich in cyclohexanone.

~~17.~~16. The process of claim ~~16~~ 15, wherein at least a portion of the first fraction is supplied to the first dehydrogenation reaction zone as the dehydrogenation feed stream.

~~18.~~17. The process of claim ~~16~~ 15, wherein at least a portion of the second fraction is supplied to the first dehydrogenation reaction zone as the dehydrogenation feed stream.

~~19.~~18. The process of claim ~~8~~ 7, wherein the hydroalkylation reaction product stream further comprises dicyclohexylbenzene and the dicyclohexylbenzene is converted to additional cyclohexylbenzene either by dealkylation or by transalkylation with benzene.