CLAIMS

1. A process for the dehydrogenation of cyclohexanone to produce phenol, the process comprising:

(a) contacting cyclohexanone in a reaction zone under dehydrogenation conditions with a dehydrogenation catalyst comprising (i) a support comprising silica; and (ii) a dehydrogenation component comprising at least one metal selected from Group 10 of the Periodic Table of Elements, wherein the dehydrogenation conditions include a temperature of about 250°C to about 500°C, a pressure of about 100 to about 3550 kPa, a weight hourly space velocity of about 0.2 to 50 hr^{-1}, and a hydrogen to cyclohexanone molar ratio of about 2 to about 20;

(b) terminating contact of the dehydrogenation catalyst with the cyclohexanone; then

(c) supplying at least one interim gas to the reaction zone wherein the interim gas is selected from an inert gas or hydrogen gas and wherein the interim gas contacts the dehydrogenation catalyst at temperatures above about 300°C; and then

(d) recontacting the dehydrogenation catalyst with additional cyclohexanone,

wherein the process occurs in the absence of oxygen.

2. The process of claim 1, wherein the contacting step (c) occurs for a period of at least one hour.

3. The process of claim 1 or claim 2, wherein the majority of the contacting step (c) occurs at temperatures above about 300°C based on contacting time.

4. The process of any one of the preceding claims, wherein the majority of the contacting step (c) occurs at temperatures between about 350°C to about 500°C based on contacting time.

5. The process of any one of the preceding claims, wherein the majority of the contacting step (c) occurs at a temperature of less than 400°C and at a pressure of less

than 500 kPa and causes at least partial reactivation of the dehydrogenation catalyst.

6. The process of any one of the preceding claims, wherein the contacting step (c) is conducted at a pressure of from 100 to 1480 kPa for a time of at least 0.5 hours.

7. The process of any one of the preceding claims, wherein the interim gas is selected from helium gas, nitrogen gas, and argon gas.

8. The process of any one of the preceding claims, wherein the at least one interim gas is hydrogen gas and wherein the interim gas comprises at least 10 mol% hydrogen.

9. The process of any one of ~~the preceding claims~~ claim 1 or claim 2, wherein the at least one interim gas ~~is inert gas wherein the interim gas~~ comprises at least 10 mol% inert gas.

10. The process of any one of the preceding claims, wherein the interim period between the terminating step (b) and the recontacting step (d) consists of the contacting (c) step.

~~11. The process of any one of the preceding claims, wherein the process occurs in the substantial absence of oxygen.~~

~~12.~~11. The process of any one of the preceding claims, wherein the contacting step (c) is with hydrogen and causes at least partial reactivation of the dehydrogenation catalyst.

~~13.~~12. The process of ~~any one of the preceding claims~~ claim 1 or claim 2, wherein the contacting step (c) causes the activity of the dehydrogenation catalyst to be ~~substantially~~ maintained.

~~14.~~13. The process of any one of the preceding claims, wherein the dehydrogenation

catalyst further comprises at least 0.1 wt% of a metal promoter comprising at least one metal component selected from Group 1 and 2 of Periodic Table of Elements.

~~15.~~14. The process of any one of the preceding claims, wherein the dehydrogenation catalyst has an oxygen chemisorption of greater than 50%.

~~16.~~15. The process of any one of the preceding claims, wherein the dehydrogenation component comprises palladium and/or platinum.

~~17. The process of any one of the preceding claims, wherein the dehydrogenation conditions include a temperature of about 250°C to about 500°C, a pressure of about 100 to about 3550 kPa, a weight hourly space velocity of about 0.2 to 50 hr^{-1}, and a hydrogen to cyclohexanone molar ratio of about 2 to about 20.~~

~~18.~~16. The process of any one of the preceding claims and further comprising:

(e) contacting benzene and hydrogen with a hydroalkylation catalyst under hydroalkylation conditions to convert at least part of the benzene to cyclohexylbenzene;

(f) oxidizing at least part of the cyclohexylbenzene from contacting step (e) to produce cyclohexylbenzene hydroperoxide;

(g) cleaving at least part of the cyclohexylbenzene hydroperoxide from oxidizing step (f) to produce phenol and cyclohexanone; and

(h) feeding at least part of the cyclohexanone from cleaving step (g) to the reaction zone.

~~19.~~17. The process of claim ~~18~~ 16, wherein at least part of the phenol from cleaving step (g) is fed to said reaction zone.

~~20.~~18. A process for the dehydrogenation of cyclohexanone to produce phenol, the process ~~consisting essentially of~~ comprising:

(a) contacting cyclohexanone in a reaction zone under dehydrogenation conditions with a dehydrogenation catalyst comprising (i) a support comprising silica;

and (ii) a dehydrogenation component comprising at least one metal selected from Group 10 of the Periodic Table of Elements, wherein the dehydrogenation conditions include a temperature of about 250°C to about 500°C, a pressure of about 100 to about 3550 kPa, a weight hourly space velocity of about 0.2 to 50 hr^{-1}, and a hydrogen to cyclohexanone molar ratio of about 2 to about 20;

(b) terminating contact of the dehydrogenation catalyst with additional cyclohexanone; then

(c) contacting the dehydrogenation catalyst with hydrogen gas at a temperature of at least 300°C; and then

(d) recontacting the dehydrogenation catalyst with additional cyclohexanone,

wherein the process occurs in the absence of oxygen.

~~21.~~19. A process for the dehydrogenation of cyclohexanone to produce phenol, the process consisting of:

(a) contacting cyclohexanone in a reaction zone under dehydrogenation conditions with a dehydrogenation catalyst comprising (i) a support comprising silica; and (ii) a dehydrogenation component comprising at least one metal selected from Group 10 of the Periodic Table of Elements, wherein the dehydrogenation conditions include a temperature of about 250°C to about 500°C, a pressure of about 100 to about 3550 kPa, a weight hourly space velocity of about 0.2 to 50 hr^{-1}, and a hydrogen to cyclohexanone molar ratio of about 2 to about 20;

(b) terminating contact of the dehydrogenation catalyst with additional cyclohexanone; then

(c) contacting the dehydrogenation catalyst with hydrogen gas at a temperature of at least 300°C; and then

(d) recontacting the dehydrogenation catalyst with additional cyclohexanone.