CLAIMS

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

(a) contacting benzene and hydrogen under hydroalkylation conditions effective to form a first effluent stream comprising cyclohexylbenzene, cyclohexane, methylcyclopentane, and unreacted benzene;

(b) contacting at least a portion of the first effluent stream with a dehydrogenation catalyst under dehydrogenation conditions to convert at least a portion of the cyclohexane to benzene thereby forming a second effluent stream, wherein the amount of methylcyclopentane in the second effluent stream is different by no more than 65% of the total amount of the portion of the first effluent stream, said amounts being on a weight basis;

(c) removing a methylcyclopentane-containing stream from the first effluent stream or the second effluent stream; and

(d) recycling at least a portion of the second effluent stream containing benzene to (a),

wherein the dehydrogenation catalyst comprises 0.05 wt% to 0.5 wt% of ~~a metal selected from Group 14 of the Periodic Table of Elements~~ tin; and 0.1 wt% to 2 wt% of a metal selected from palladium and platinum, the wt%s being based upon total weight of the dehydrogenation catalyst.

2. The process of claim 1, wherein the amount of methylcyclopentane in the second effluent stream is different by no more than 30% of the total amount of the portion of the first effluent stream, said amounts being on a weight basis.

3. The process of claim 1 or claim 2, wherein the amount of methylcyclopentane in the second effluent stream is different by no more than 10% of the total amount of portion of the first effluent stream, said amounts being on a weight basis.

4. The process of any one of the preceding claims, wherein the amount of methylcyclopentane in the second effluent stream is different by no more than 2% of

the total amount of the portion of the first effluent stream, said amounts being on a weight basis.

5. The process of any one of the preceding claims, wherein a cyclohexylbenzene-containing stream is recovered from said first effluent stream prior to said contacting step (b).

6. The process of claim 5, wherein the cyclohexylbenzene-containing stream is recovered from said first effluent stream by fractionation.

7. The process of any one of the preceding claims, wherein the contacting step (a) is conducted in the presence of a hydroalkylation catalyst comprising a molecular sieve of the MCM-22 family and a hydrogenation metal.

~~8. The process of claim 1, wherein the metal selected from Group 14 of the Periodic Table of Elements comprises tin.~~

~~9.~~8. The process of any one of the preceding claims, wherein the dehydrogenation conditions comprise a temperature between 200°C and 550°C and a pressure between 100 kPa and 7,000 kPa, gauge.

~~10.~~9. The process of any one of the preceding claims, wherein the methylcyclopentane-containing stream is removed from either the first or the second effluent stream by fractionation.

~~11.~~10. The process of any one of the preceding claims, wherein the methylcyclopentane-containing stream contains from 5 wt% to 50 wt% methylcyclopentane, the wt% based upon the weight of the methylcyclopentane-containing stream.

~~12.~~11. The process of any one of the preceding claims, wherein the methylcyclopentane-containing stream contains from 5 wt% to 50 wt% cyclohexane, the wt% based upon the weight of the methylcyclopentane-containing stream.

~~13.~~12. The process of any one of the preceding claims, wherein the methylcyclopentane-containing stream contains from 10 wt% to 80 wt% benzene, the wt% based upon the weight of the methylcyclopentane-containing stream.

~~14.~~13. The process of any one of the preceding claims, wherein the portion of the second effluent stream that is recycled to the contacting step (a) contains from 0.1 wt% to 5 wt% methylcyclopentane, the wt% based upon the weight of the portion of the second effluent stream.

~~15.~~14. The process of any one of the preceding claims, wherein the portion of the second effluent stream that is recycled to the contacting step (a) contains from 0.1 wt% to 1 wt% methylcyclopentane, the wt% based upon the weight of the portion of the second effluent stream.

~~16.~~15. The process of any one of the preceding claims, wherein the portion of the second effluent stream that is recycled to the contacting step (a) contains from 0.1 wt% to 10 wt% cyclohexane, the wt% based upon the weight of the portion of the second effluent stream.

~~17.~~16. A process for producing cyclohexylbenzene, the process comprising:

(a) contacting benzene and hydrogen under hydroalkylation conditions effective to form a first effluent stream comprising cyclohexylbenzene, cyclohexane, methylcyclopentane, and unreacted benzene;

(b) contacting at least a portion of the first effluent stream with a dehydrogenation catalyst under dehydrogenation conditions sufficient to convert at least a portion of the cyclohexane in the first effluent stream portion to benzene and form a second effluent stream, wherein less than 10% of the methylcyclopentane in the second effluent stream is converted to a paraffin on a weight basis;

(c) removing a methylcyclopentane-containing stream from either the first effluent stream or the second effluent stream; and

(d) recycling at least a portion of the second effluent stream containing benzene to (a),

wherein the dehydrogenation catalyst comprises 0.05 wt% to 0.5 wt% of ~~a metal selected from Group 14 of the Periodic Table of Elements~~ tin; and 0.1 wt% to 2 wt% of a metal selected from palladium and platinum, the wt%s being based upon total weight of the dehydrogenation catalyst.