9. The process of claim 1, wherein the isobutylene-containing C_4 raffinate stream is reacted with the phenol in the presence of ~~a Group IIIb metal~~ at a reaction temperature ranging from about 50° C to about 150° C and under pressure ranging from 0 to 500 psig, wherein the molar ratio of isobutylene to phenol ranges from about 0.5:1 to about 3:1.

10. The process of claim 9, further comprising the step of transalkylating the 2,6-di-tert-butyl phenol to form a compound selected from the group consisting of para-tert-butyl phenol, 2,4-di-tert-butyl phenol, and a combination thereof.

11. The process of claim 9, wherein the isobutylene-containing C_4 raffinate stream contains at least 75% by weight isobutylene.

~~12. The process of claim 9, wherein the Group IIIb metal is aluminum.~~

~~13.~~ The process of claim 1, wherein the phenol is an ortho-tert-butyl phenol.

~~14.~~ The process of claim ~~13~~, wherein the isobutylene-containing C_4 raffinate stream is reacted with ortho-tert-butyl phenol in the presence of aluminum or aluminum trisphenoxide at a reaction temperature ranging from about 10° C to about 20° C and under pressure ranging from 0 to 50 psig, wherein the molar ratio of isobutylene to ortho-tert-butyl phenol ranges from about 0.8:1 to about 1.2:1.

~~15.~~ The process of claim ~~14~~, wherein the aluminum trisphenoxide is formed by the reaction of a trialkyl aluminum with ortho-tert-butyl phenol.

~~16.~~ The process of claim 1, wherein the reaction is run in a batch mode, continuous mode, stirred-tank reactor, continuous stirred-tank reactor, fixed-bed reactor, or fluidized bed reactor.

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~~17.~~ A process for producing 2,6-di-tert-butyl phenol, comprising reacting a phenol with a C_4 raffinate stream containing (a) isobutylene, and (b) 1-butene and/or 2-butene under reaction conditions, including a reaction temperature ranging from about 70° C to about 130° C, that selectively react the isobutylene with the phenol to produce the 2,6-di-tert-butyl phenol without substantially reacting the 1-butene or 2-butene with the phenol, wherein the molar ratio of isobutylene to phenol ranges from about 1.8:1 to about 2.8:1.

~~18.~~ The process of claim ~~17~~, wherein less than 1% by weight of the 1-butene and 2-butene present in the C_4 raffinate stream is reacted with the phenol.

~~19.~~ The process of claim ~~17~~, wherein at least 80% by weight of the phenol reacts with the isobutylene.

~~20.~~ The process of claim ~~17~~, wherein the process produces less than 0.1% by weight of sec-butyl phenols.

~~21.~~ The process of claim ~~17~~, wherein the isobutylene-containing C_4 raffinate stream is directly reacted with a phenol, the reaction proceeding without an intermediate step of forming an alkyl-tert-butyl ether.

~~22.~~ The process of claim ~~21~~, wherein the alkyl-tert-butyl ether is methyl-tert-butyl ether or methyl-tert-amyl ether.

~~23.~~ The process of claim ~~17~~, wherein the isobutylene-containing C_4 raffinate stream is directly reacted with a phenol, the reaction proceeding without an intermediate step of introducing an alcohol into the C_4 raffinate stream.

~~24.~~ The process of claim ~~23~~, wherein the alcohol is methanol or amyl alcohol.

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~~25.~~ The process of claim ~~17~~, wherein the isobutylene-containing C_4 raffinate stream contains at least 75% by weight isobutylene.

~~26.~~ The process of claim ~~17~~, wherein the isobutylene-containing C_4 raffinate stream is reacted with the phenol in the presence of ~~a Group IIIb metal~~.

~~27. The process of claim 26, wherein the Group IIIb metal is aluminum.~~

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9. The process of claim 1, wherein the isobutylene-containing C_4 raffinate stream is reacted with the phenol in the presence of aluminum at a reaction temperature ranging from about 50° C to about 150° C and under pressure ranging from 0 to 500 psig, wherein the molar ratio of isobutylene to phenol ranges from about 0.5:1 to about 3:1.

10. The process of claim 9, further comprising the step of transalkylating the 2,6-di-tert-butyl phenol to form a compound selected from the group consisting of para-tert-butyl phenol, 2,4-di-tert-butyl phenol, and a combination thereof.

11. The process of claim 9, wherein the isobutylene-containing C_4 raffinate stream contains at least 75% by weight isobutylene.

12. The process of claim 1, wherein the phenol is an ortho-tert-butyl phenol.

13. The process of claim 12, wherein the isobutylene-containing C_4 raffinate stream is reacted with ortho-tert-butyl phenol in the presence of aluminum or aluminum trisphenoxide at a reaction temperature ranging from about 10° C to about 20° C and under pressure ranging from 0 to 50 psig, wherein the molar ratio of isobutylene to ortho-tert-butyl phenol ranges from about 0.8:1 to about 1.2:1.

14. The process of claim 13, wherein the aluminum trisphenoxide is formed by the reaction of a trialkyl aluminum with ortho-tert-butyl phenol.

15. The process of claim 1, wherein the reaction is run in a batch mode, continuous mode, stirred-tank reactor, continuous stirred-tank reactor, fixed-bed reactor, or fluidized bed reactor.

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16. A process for producing 2,6-di-tert-butyl phenol, comprising reacting a phenol with a C_4 raffinate stream containing (a) isobutylene, and (b) 1-butene and/or 2-butene under reaction conditions, including a reaction temperature ranging from about 70° C to about 130° C, that selectively react the isobutylene with the phenol to produce the 2,6-di-tert-butyl phenol without substantially reacting the 1-butene or 2-butene with the phenol, wherein the molar ratio of isobutylene to phenol ranges from about 1.8:1 to about 2.8:1.

17. The process of claim 16, wherein less than 1% by weight of the 1-butene and 2-butene present in the C_4 raffinate stream is reacted with the phenol.

18. The process of claim 16, wherein at least 80% by weight of the phenol reacts with the isobutylene.

19. The process of claim 16, wherein the process produces less than 0.1% by weight of sec-butyl phenols.

20. The process of claim 16, wherein the isobutylene-containing C_4 raffinate stream is directly reacted with a phenol, the reaction proceeding without an intermediate step of forming an alkyl-tert-butyl ether.

21. The process of claim 20, wherein the alkyl-tert-butyl ether is methyl-tert-butyl ether or methyl-tert-amyl ether.

22. The process of claim 16, wherein the isobutylene-containing C_4 raffinate stream is directly reacted with a phenol, the reaction proceeding without an intermediate step of introducing an alcohol into the C_4 raffinate stream.

23. The process of claim 22, wherein the alcohol is methanol or amyl alcohol.

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24. The process of claim 16, wherein the isobutylene-containing C_4 raffinate stream contains at least 75% by weight isobutylene.

25. The process of claim 16, wherein the isobutylene-containing C_4 raffinate stream is reacted with the phenol in the presence of aluminum.

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