

CLAIMS:

1. A method of hydrotreating an olefinic naphtha feedstream in the presence of an increased carbon monoxide content, the method comprising:

contacting a first olefinic naphtha feedstream with a first hydrogen-containing treat gas stream in the presence of a first hydrotreating catalyst in a first hydrotreating reactor under first hydrotreating conditions sufficient to at least partially hydrodesulfurize and/or hydrodenitrogenate the first olefinic naphtha feedstream to produce a first hydrotreated olefinic naphtha product stream; and

contacting at least a portion of the first hydrotreated olefinic naphtha product stream with a second hydrogen-containing treat gas stream in the presence of a second hydrotreating catalyst under second hydrotreating conditions sufficient to at least partially hydrodesulfurize and/or hydrodenitrogenate the first hydrotreated olefinic naphtha product stream to produce a second hydrotreated olefinic naphtha product stream,

wherein the first olefinic naphtha feedstream and the first hydrogen-containing treat gas stream collectively have a carbon monoxide content of greater than 10 vppm and a carbon dioxide content of greater than 15 vppm; and

wherein the first hydrotreating catalyst converts at least 5% less carbon dioxide to carbon monoxide than the second hydrotreating catalyst at the same hydrotreating conditions; and

wherein the first hydrotreating catalyst comprises cobalt and molybdenum disposed on a silica-based support.

2. The method of claim 1, wherein the first hydrotreating conditions are selected such that the first hydrotreating catalyst has a first relative hydrodesulfurization activity that is at least 10% greater than that of an identical catalyst under identical conditions except that the identical conditions include a collective carbon monoxide content of the first olefinic naphtha feedstream and first hydrogen-containing treat gas being less than 10 vppm.

3. The method of any of claims 1 or 2, wherein the first olefinic naphtha feedstream is comprised of an FCC naphtha.

4. The method of claim 3, wherein the silica-based support comprises at least 85 wt% silica.
5. The method of claim 4, wherein the first hydrogen-containing treat gas stream has a carbon monoxide concentration of greater than 15 vppm.
6. The method of claim 4, wherein the first hydrotreating catalyst has a cobalt content from about 2 wt% to about 7 wt%, measured as oxide and based on total weight of the catalyst, and a molybdenum content from about 7 wt% to about 25 wt%, measured as oxide and based on total weight of the catalyst.
7. The method of claim 6, wherein the first hydrotreating catalyst has an average pore volume between about 0.6 cc/g and about 2.0 cc/g and an average pore diameter in the range of about 200Å to 2000Å.
8. The method of claim 7, wherein the first hydrotreating catalyst comprises at least one organic additive.
9. The method of claim 8, wherein the first olefinic naphtha feedstream and the first hydrogen-containing treat gas stream collectively have a carbon monoxide content of greater than 15 vppm.
10. The method of claim 9, wherein the first olefinic naphtha feedstream and the first hydrogen-containing treat gas stream collectively have a carbon monoxide content of greater than 25 vppm.
11. The method of claim 2, wherein the first hydrotreating conditions are selected such that the first hydrotreating catalyst has a first relative hydrodesulfurization activity that is at least 20% greater than that of an identical catalyst under identical conditions except that the identical conditions include a collective carbon monoxide content of the first olefinic naphtha feedstream and first hydrogen-containing treat gas being less than 10 vppm.

12. The method of claim 1, ~~further comprising contacting wherein the~~ at least a portion of the first hydrotreated olefinic naphtha product stream is contacted with a the second hydrogen-containing treat gas stream in the presence of a the second hydrotreating catalyst in a second hydrotreating reactor, ~~under second hydrotreating conditions sufficient to at least partially hydrodesulfurize and/or hydrodenitrogenate the first hydrotreated olefinic naphtha product stream to produce a second hydrotreated olefinic naphtha product stream.~~

13. The method of claim 2, ~~further comprising contacting wherein the~~ at least a portion of the first hydrotreated olefinic naphtha product stream is contacted with a the second hydrogen-containing treat gas stream in the presence of a the second hydrotreating catalyst in a second hydrotreating reactor, ~~under second hydrotreating conditions sufficient to at least partially hydrodesulfurize and/or hydrodenitrogenate the first hydrotreated olefinic naphtha product stream to produce a second hydrotreated olefinic naphtha product stream.~~

14. The method of any of claims 12 or 13, wherein the first olefinic naphtha feedstream is comprised of an FCC naphtha.

15. The method of claim 14, wherein the silica-based support comprises at least 85 wt% silica.

16. The method of claim 15, wherein the first hydrogen-containing treat gas stream has a carbon monoxide concentration of greater than 15 vppm.

17. The method of claim 15, wherein the first hydrotreating catalyst has a cobalt content from about 2 wt% to about 7 wt%, measured as oxide and based on total weight of the catalyst, and a molybdenum content from about 7 wt% to about 25 wt%, measured as oxide and based on total weight of the catalyst.

18. The method of claim 17, wherein the first hydrotreating catalyst has an average pore volume between about 0.6 cc/g and about 2.0 cc/g and an average pore diameter in the range of about 200Å to 2000Å.

19. The method of claim 18, wherein the first hydrotreating catalyst comprises at least one organic additive.
20. The method of claim 19, wherein the first olefinic naphtha feedstream and the first hydrogen-containing treat gas stream collectively have a carbon monoxide content of greater than 15 vppm.
21. The method of claim 20, wherein the first olefinic naphtha feedstream and the first hydrogen-containing treat gas stream collectively have a carbon monoxide content of greater than 25 vppm.
22. The method of claim 19, wherein the second hydrotreating catalyst comprises cobalt and molybdenum disposed on an alumina-based support wherein the alumina-based support contains at least 85 wt% alumina.
23. The method of claim 22, wherein the second hydrotreating catalyst has a cobalt content from about 0.1 wt% to about 5 wt%, measured as oxide and based on total weight of the catalyst, and a molybdenum content from about 1 wt% to about 10 wt%, measured as oxide and based on total weight of the catalyst.
24. The method of claim 23, wherein the second hydrotreating catalyst has an average pore volume between about 0.5 cc/g and about 1.5 cc/g and an average pore diameter in the range of about 60Å to 200Å.
25. The method of claim 24, wherein the first olefinic naphtha feedstream and the first hydrogen-containing treat gas stream collectively have a CO_x content from 15 vppm to 550 vppm.
- ~~26. The method of claim 24, wherein the first hydrotreating catalyst converts at least 5% less carbon dioxide to carbon monoxide than the second hydrotreating catalyst at the same hydrotreating conditions.~~

~~27.26.~~ The method of claim 1, further comprising contacting the first hydrotreated olefinic naphtha product stream with a second hydrotreating catalyst, wherein the first hydrotreating catalyst and the second hydrotreating catalyst are in a stacked configuration within the first hydrotreating reactor such that the first hydrotreated olefinic naphtha product stream contacts the second hydrotreating catalyst to produce a second hydrotreated olefinic naphtha product stream which is withdrawn from the first hydrotreating reactor.

~~28.27.~~ The method of claim ~~27~~ 26, wherein the first hydrotreating catalyst has a cobalt content from about 2 wt% to about 7 wt%, measured as oxide and based on total weight of the catalyst, and a molybdenum content from about 7 wt% to about 25 wt%, measured as oxide and based on total weight of the catalyst.

~~29.28.~~ The method of claim ~~28~~ 27, wherein the first hydrotreating catalyst has an average pore volume between about 0.6 cc/g and about 2.0 cc/g and an average pore diameter in the range of about 200Å to 2000Å.

~~30.29.~~ The method of claim ~~29~~ 28, wherein the first hydrotreating catalyst comprises at least one organic additive.

~~31.30.~~ The method of claim ~~30~~ 29, wherein the first olefinic naphtha feedstream and the first hydrogen-containing treat gas stream collectively have a carbon monoxide content of greater than 15 vppm.

~~32.31.~~ The method of claim ~~31~~ 30, wherein the first olefinic naphtha feedstream and the first hydrogen-containing treat gas stream collectively have a carbon monoxide content of greater than 25 vppm.

~~33.32.~~ The method of claim ~~30~~ 29, wherein the second hydrotreating catalyst comprises cobalt and molybdenum disposed on an alumina-based support wherein the alumina-based support contains at least 85 wt% alumina.

~~34.~~33. The method of claim ~~33~~ 32, wherein the second hydrotreating catalyst has a cobalt content from about 0.1 wt% to about 5 wt%, measured as oxide and based on total weight of the catalyst, and a molybdenum content from about 1 wt% to about 10 wt%, measured as oxide and based on total weight of the catalyst.

~~35.~~34. The method of claim ~~34~~ 33, wherein the second hydrotreating catalyst has an average pore volume between about 0.5 cc/g and about 1.5 cc/g and an average pore diameter in the range of about 60Å to 200Å.