

CLAIMS:

What is claimed is:

1. A steam cracking method, comprising
 - 5 providing a hydrocarbon feed comprising hydrocarbon and a first nitrogen material;
introducing the hydrocarbon feed to a steam cracker to produce a steam cracker effluent;
separating from the steam cracker effluent a steam cracker tar and an upgraded steam cracker effluent;
 - 10 separating from the upgraded steam cracker effluent (i) a process gas comprising a second nitrogen material and (ii) a Pygas comprising a third nitrogen material, wherein the second and third nitrogen materials are each a portion of the first nitrogen material and/or are each derived from a portion of the first nitrogen material;
separating from the Pygas stream a concentrated Pygas and a separated water component containing at least a portion of the third nitrogen material;
 - 15 separating from the separated water component a light effluent and a remaining water component, wherein the light effluent comprises at least a portion of the third nitrogen material;
and
removing at least a portion of the third nitrogen material in the light effluent to produce
20 a purified light effluent.
2. The method of claim 1, wherein the separation of at least a portion of the light effluent's nitrogen material includes:
 - condensing at least a portion of the light effluent's nitrogen material and/or condensing
25 at least a portion of the purified light effluent's nitrogen material; and
transferring at least a portion of the condensed nitrogen material to at least one vessel.
3. The method of claim 2, wherein the condensation occurs at a temperature in a range of about 100°C to about 150°C.
- 30 4. The method according claim 3, wherein the condensation occurs at a temperature in a range of about 120°C to about 130°C.

5. The method according to any one of claims 1-4, wherein the separation of the Pygas stream and the process gas is carried out in at least one primary fractionator and/or in at least one quench tower, and further comprising transferring at least a portion of the purified light effluent to the quench tower.
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6. The method according to any one of claims 1-5, wherein (i) the separation of the concentrated Pygas and the separated water component is carried out in an oil and water separator, (ii) the separation of the light effluent and the remaining water component is carried out in a water stripper, (iii) the separated water component comprises at least a portion of the
- 10 third nitrogen material; and further comprising removing from the separated water component at least a portion of the separated water component's portion of the third nitrogen material at a location downstream of the oil and water separator and upstream of the water stripper.
7. The method according to any one of claims 1-6, further comprising:
- 15 transferring the process gas through a compressor and a condenser and into a knockout drum to produce a compressed process gas comprising first portion of the second nitrogen material, a hydrocarbon-water mixture, and a purge fluid comprising a second portion of the second nitrogen material.
- 20 8. The method of claim 7, further transferring to an amine solution in an amine tower at least a first portion of the compressed process gas's nitrogen material to produce a partially-purified process gas.
9. The method of claim 8, further comprising circulating an amine solution between the
- 25 amine tower and an amine regenerator.
10. The method of claim 9, further comprising removing from the amine solution at least a part of the second nitrogen material in the amine solution in the amine regenerator.
- 30 11. The method of claim 9 or claim 10, further comprising transferring away from the partially-purified process gas at least part of the second nitrogen material in the partially-purified process gas to produce a purified process.

12. The method of claim 11, wherein the transfer of at least a portion of the partially-purified process gas's second nitrogen material is carried out using a water wash within a caustic tower.
- 5 13. The method of claim 12, further comprising combining acid with the water wash.
14. The method of any of claims 11-13, further compressing the purified process gas.
15. The method of claim 14, further comprising flowing the compressed purified process
10 gas through a drier-ammonia bed to transfer to the drier-ammonia bed at least a portion of any remaining second nitrogen material in the purified process gas to produce an upgraded process gas.
16. The method of claim 15, further comprising removing from the drier-ammonia bed at
15 least a portion of the transferred second nitrogen material.
17. The method of claim 15 or claim 16, further comprising (i) separating olefin from purified process gas and (ii) polymerizing at least a portion of the separated olefin.
- 20 18. The method according to any of claims 1-16, wherein the portion of the third nitrogen material in the light effluent comprises one or more of ammonia, ammonium, amine, nitrile, hydrogen cyanide, one or more NO_x compounds, and one or more ions and/or salts of NO_x compounds.
- 25 19. A method for producing light olefins from a feed comprising heavy hydrocarbon and a first nitrogen material, comprising:
introducing a hydrocarbon feed to a steam cracker to produce a steam cracker effluent;
separating from the steam cracker effluent a steam cracker tar and an upgraded steam
cracker effluent;
30 separating from the upgraded steam cracker effluent at least (i) a process gas comprising a second nitrogen material and (ii) a Pygas comprising a third nitrogen material, wherein the second and third nitrogen materials are each a portion of the first nitrogen material and/or are each derived from a portion of the first nitrogen material;

- transferring the process gas through a compressor and a condenser and into a knockout drum to produce a compressed process gas comprising first portion of the process gas's second nitrogen material, a hydrocarbon-water mixture, and a purge fluid comprising a second portion of the process gas's second nitrogen material; and
- 5 flowing the compressed process gas through an amine tower and a caustic tower to produce a purified process gas.
20. The method of claim 19, further comprising removing at least a portion of the compressed process gas's second nitrogen material in the amine tower, the caustic tower, or a
- 10 combination thereof.
21. The method of claim 20, further comprising:
- circulating an amine solution between the amine tower and an amine regenerator, wherein the amine solution comprises at least a portion of the second nitrogen material removed
- 15 from the compressed process gas; and
- removing at least a portion of the amine solution's second nitrogen material from the amine regenerator.
22. The method according to any one of claims 19-21, further comprising:
- 20 compressing the purified process gas;
- removing transferring at least a portion of any second nitrogen material in the compressed purified process gas to a at least one drier-ammonia bed to produce an upgraded process gas; and
- conducting away from the drier-ammonia bed at least a portion of the transferred second
- 25 nitrogen material.
23. The method according to any one of claims 19-22, wherein the second nitrogen material includes ammonia and/or ammonium.
- 30 24. The method according to any one of claims 19-23, wherein the second nitrogen material includes one or more of amine; nitrile; hydrogen cyanide; one or more NO_x compounds; one or more ions of NO_x compounds, and one or more salts of NO_x compounds.

25. A heavy-hydrocarbon conversion process, comprising:
- introducing a feed to a steam cracker to produce a steam cracker effluent, wherein the feed comprises heavy hydrocarbon and a first nitrogen material;
 - separating from the steam cracker effluent in at least one tar knock-out drum at least a
5 steam cracker tar and an upgraded steam cracker effluent;
 - separating from the upgraded steam cracker effluent at least a (i) a process gas containing a second nitrogen material and (ii) a Pygas containing a third nitrogen material, wherein the separation is carried out in a primary fractionator and/or quench tower, the second nitrogen material is a portion of the first nitrogen material and/or is derived from a portion of
10 the first nitrogen material, and the third nitrogen material is a portion of the first nitrogen material and/or is derived from a portion of the first nitrogen material;
 - compressing the process gas and separating from the compressed and/or partially-compressed process gas a purge fluid comprising a portion of the second nitrogen material;
 - contacting the compressed process gas with a lean amine composition in at least one
15 amine tower to produce a rich amine composition and a partially-purified process gas;
 - contacting the partially-purified process gas with a lean caustic composition in at least one caustic tower to produce a rich caustic composition and a purified process gas;
 - removing at least a portion of any of the second nitrogen material in the rich amine composition in at least one amine regenerator to produce a regenerated amine composition, and
20 recycling at least a portion of the regenerated amine composition as the lean amine composition;
 - removing in a at least one drier-ammonia bed at least a portion of any remaining second nitrogen material in the purified process gas to produce an upgraded process gas;
 - conducting away from the drier-ammonia bed at least a portion of the second nitrogen
25 material removed from the purified process gas;
 - separating a water component from the Pygas stream in at least one oil and water separator to produce a concentrated Pygas;
 - separating a light effluent and a remaining water component from the separated water component in a least one stripper, to produce a light effluent and a remaining water component,
30 wherein the light effluent comprises at least a portion of the third nitrogen material; and
 - separating from the light effluent at least a portion of the third nitrogen material to produce a purified light effluent.

26. The process of claim 25, further comprising (i) separating at least a C₄ stream from the low-ammonia hydrocarbon stream, and (ii) contacting at least part of the C₄ stream with water to produce an upgraded C₄ stream comprising isobutene, wherein at least a portion of any acetonitrile in the C₄ stream is transferred to the water.
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27. The process of claim 26, further comprising catalytically converting at least a portion of the isobutene to diisobutene and/or MTBE.
28. A system for managing nitrogen material during steam cracking of a crude feed
- 10 comprising heavy hydrocarbons, the system comprising:
- a steam cracker comprising a convection line and a radiant line there within;
 - a flash separation vessel fluidly coupled to and downstream of the convection line and fluidly coupled to and downstream of the radiant line;
 - a tar knock-out drum fluidly coupled to and downstream of the radiant line;

15 a fractionator fluidly coupled to and downstream of the tar knock-out drum;

 - a quench tower fluidly coupled to and downstream of the fractionator;
 - an oil and water separator fluidly coupled to and downstream of the quench tower; and
 - a water stripper fluidly coupled to and downstream of the oil and water separator,
- wherein the water stripper comprises an overhead which is fluidly coupled to and upstream of
- 20 a condenser and a vessel by a first line and fluidly coupled to and upstream of the quench tower by a second line.