CLAIMS:

1. A process for removing nitrogen compounds from a fuel comprising:

(a) contacting the fuel comprising nitrogen compounds with a fuel-immiscible caprolactamium ionic liquid to produce a mixture comprising the fuel and the fuel-immiscible caprolactamium ionic liquid; and

(b) separating the mixture to produce a fuel effluent and a fuel -immiscible caprolactamium ionic liquid effluent, the fuel -immiscible caprolactamium ionic liquid effluent comprising the nitrogen compound.

2. The process of claim 1 wherein said fuel effluent comprises at least 50% less of said nitrogen compounds than said fuel before being contacted with said caprolactamium ionic liquid.

3. The process of claim 1 wherein the mixture further comprises water in an amount less than 10% relative to the amount of fuel -immiscible caprolactamium ionic liquid in the mixture on a weight basis.

4. The process of claim 1 further comprising passing at least a portion of the fuel effluent to a hydrocarbon conversion process.

5. The process of claim 1 further comprising washing at least a portion of the fuel effluent with water to produce a washed fuel stream and a spent water stream.

6. The process of claim 5 further comprising passing at least a portion of the washed fuel effluent stream to a hydrocarbon conversion process.

7. The process of claim 1 further comprising contacting the fuel-immiscible caprolactamium ionic liquid effluent with a regeneration solvent and separating the fuel-immiscible caprolactamium ionic liquid effluent from the regeneration solvent to produce an extract stream comprising the nitrogen compound and a regenerated fuel -immiscible caprolactamium ionic liquid stream.

8. The process of claim 7 wherein the regeneration solvent comprises a lighter hydrocarbon fraction relative to the fuel and the extract stream further comprises the lighter hydrocarbon fraction, the lighter hydrocarbon fraction being immiscible with the fuel -immiscible caprolactamium ionic liquid.

9. The process of claim 1 wherein the fuel effluent comprises fuel-immiscible caprolactamium ionic liquid, further comprising washing at least a portion of the fuel effluent with water to produce a washed vacuum gas oil or diesel fuel and a spent water stream, the spent

water stream comprising the fuel-immiscible caprolactamium ionic liquid; wherein at least a portion of the spent water stream is at least a portion of the regeneration solvent.

10. The process of claim 1 wherein the fuel-immiscible caprolactamium ionic liquid effluent is purified and is then used in the production of caprolactam.

CLAIMS

The invention claimed is:

1. A process for removing nitrogen compounds from a fuel comprising:

(a) contacting the fuel comprising nitrogen compounds with a fuel-immiscible caprolactamium ionic liquid to produce a mixture comprising the fuel and the fuel-immiscible caprolactamium ionic liquid; and

(b) separating the mixture to produce a fuel effluent and a fuel-immiscible caprolactamium ionic liquid effluent, the fuel-immiscible caprolactamium ionic liquid effluent comprising the nitrogen compound.

2. The process of claim 1 wherein said fuel is a vacuum gas oil or a diesel fuel.

3. The process of claim 1 wherein said fuel effluent comprises at least 50% less of said nitrogen compounds than said fuel before being contacted with said caprolactamium ionic liquid.

4. The process of claim 1 wherein the fuel effluent comprises at least 70% less of said nitrogen compounds than said fuel before being contacted with said caprolactamium ionic liquid.

5. The process of claim 1 wherein the mixture further comprises water in an amount less than 10% relative to the amount of fuel-immiscible caprolactamium ionic liquid in the mixture on a weight basis.

6. The process of claim 1 wherein the ratio of the fuel to the fuel-immiscible caprolactamium ionic liquid in the mixture ranges from about 1:1000 to about 1000:1 on a weight basis.

7. The process of claim 1 wherein the contacting step is conducted at a first temperature and the separating step is conducted at a second temperature, the first temperature and the second temperature ranging from about 10° C. to less than the decomposition temperature of the fuel-immiscible caprolactamium ionic liquid.

8. The process of claim 7 wherein the second temperature is at least 5° C. less than the first temperature.

9. The process of claim 1 further comprising passing at least a portion of the fuel effluent to a hydrocarbon conversion process.

10. The process of claim 1 further comprising washing at least a portion of the fuel effluent with water to produce a washed fuel stream and a spent water stream.

11. The process of claim 10 further comprising passing at least a portion of the washed fuel effluent stream to a hydrocarbon conversion process.

12. The process of claim 1 further comprising contacting the fuel-immiscible caprolactamium ionic liquid effluent with a regeneration solvent and separating the fuel-immiscible caprolactamium ionic liquid effluent from the regeneration solvent to produce an extract stream comprising the nitrogen compound and a regenerated fuel-immiscible caprolactamium ionic liquid stream.

13. The process of claim 12 further comprising recycling at least a portion of the regenerated fuel-immiscible caprolactamium ionic liquid stream to the nitrogen compounds contacting step of claim 1(a).

14. The process of claim 12 wherein the regeneration solvent comprises a lighter hydrocarbon fraction relative to the fuel and the extract stream further comprises the lighter hydrocarbon fraction, the lighter hydrocarbon fraction being immiscible with the fuel-immiscible caprolactamium ionic liquid.

15. The process of claim 1 wherein the fuel effluent comprises fuel-immiscible caprolactamium ionic liquid, further comprising washing at least a portion of the fuel effluent with water to produce a washed vacuum gas oil or diesel fuel and a spent water stream, the spent water stream comprising the fuel-immiscible caprolactamium ionic liquid; wherein at least a portion of the spent water stream is at least a portion of the regeneration solvent.

16. The process of claim 15 further comprising drying at least a portion of at least one of the regenerated fuel-immiscible caprolactamium ionic liquid stream, and the spent water stream to produce a dried fuel-immiscible caprolactamium ionic liquid stream.

17. The process of claim 16 further comprising recycling at least a portion of the dried fuel-immiscible caprolactamium ionic liquid stream to the nitrogen compounds contacting step of claim 1(a).

18. The process of claim 1 wherein the fuel-immiscible caprolactamium ionic liquid effluent is purified and is then used in the production of caprolactam.

19. A process for removing nitrogen compounds from a fuel comprising:

(a) contacting the fuel comprising the nitrogen compounds with a fuel-immiscible caprolactamium ionic liquid to produce a mixture comprising the fuel, and the fuel-immiscible caprolactamium ionic liquid;

(b) separating the mixture to produce a fuel effluent and a fuel-immiscible caprolactamium ionic liquid effluent, the fuel-immiscible caprolactamium ionic liquid effluent comprising the nitrogen compound;

(c) washing at least a portion of the fuel effluent with water to produce a washed fuel stream and a spent water stream;

(d) contacting the fuel-immiscible caprolactamium ionic liquid effluent with a regeneration solvent and separating the fuel-immiscible caprolactamium ionic liquid effluent from the regeneration solvent to produce an extract stream comprising the nitrogen compound and a regenerated fuel-immiscible caprolactamium ionic liquid stream; and

(e) drying at least a portion of at least one of the fuel-immiscible caprolactamium ionic liquid effluent; the spent water stream, and the regenerated fuel-immiscible caprolactamium ionic liquid stream to produce a dried fuel-immiscible caprolactamium ionic liquid stream.

20. The process of claim 19 further comprising recycling at least a portion of at least one of the fuel-immiscible caprolactamium ionic liquid effluent; the spent water stream, the regenerated fuel-immiscible caprolactamium ionic liquid stream, and the dried fuel-

immiscible caprolactamium ionic liquid stream to the nitrogen compounds contacting step of step (a).