

WHAT IS CLAIMED IS:

1. A method of generating power, comprising:
pressurizing a concentrated draw solution comprising ammonia and carbon dioxide in a ratio of at least 1 to 1 on a first side of a semi-permeable membrane;
introducing a dilute working fluid on an opposite side of the semi-permeable membrane;
promoting flow of the dilute working fluid across the semi-permeable membrane into the pressurized draw solution to generate a dilute draw solution;
inducing flow of the dilute draw solution through a turbine;
thermally separating ammonia and carbon dioxide from solvent of the dilute draw solution; and
recycling the ammonia and carbon dioxide to regenerate the concentrated draw solution.
2. The method according to claim 1, wherein the concentrated draw solution has an ammonia to carbon dioxide ratio of between about 1 to 1 and 2.5 to 1.
3. The method according to claim 1, wherein the concentrated draw solution has a concentration of between 0.1 and 12 molar.
4. The method according to claim 3, wherein the concentrated draw solution has a concentration of between about 3 to about 6 molar.
5. The method of claim 1, wherein thermally separating ammonia and carbon dioxide from the dilute draw solution comprises a gas stripping process.
6. The method of claim 5, wherein the gas stripping process comprises use of low temperature steam under vacuum.
7. The method of claim 5, wherein the gas stripping process is performed at a temperature of between about 35 °C and 250 °C and a pressure of between about 0.05 atm and about 10 atm.

8. The method of claim 1, wherein promoting flow of the dilute working fluid across the semi-permeable membrane comprises promoting a water flux of at least about $25 \times 10^{-6} \text{ m}^3/\text{m}^2\text{-s}$.
9. An osmotic heat engine, comprising:
a first chamber;
a second chamber;
a semi-permeable membrane fluidly coupling the first chamber and the second chamber;
a source of a dilute working fluid fluidly connected to the first chamber;
a source of a concentrated draw solution comprising ammonia and carbon dioxide in a ratio of at least 1 to 1 fluidly connected to the second chamber;
a pressure exchanger to pressurize the concentrated draw solution in the second chamber;
a turbine fluidly connected downstream of the second chamber;
a gas stripping operation fluidly connected downstream of the turbine; and
a recycle system fluidly connecting the gas stripping operation to the first and second chambers.
10. The osmotic heat engine according to claim 9, wherein the concentrated draw solution has an ammonia to carbon dioxide ratio of between about 1 to 1 and 2.5 to 1.
11. The osmotic heat engine according to claim 10, wherein the concentrated draw solution has a concentration of between 0.1 and 12 molar.
12. The osmotic heat engine of claim 9, wherein the gas stripping operation comprises a distillation column.
13. The osmotic heat engine of claim 12, further comprising a source of low grade heat thermally connected to the gas stripping operation.
14. The osmotic heat engine of claim 9, wherein power output per membrane area of the osmotic heat engine is at least about 150 W/m^2 .

WHAT IS CLAIMED IS:

1. A method of generating power using an ammonia-carbon dioxide osmotic heat engine, the method comprising the steps of:
 - pressurizing a concentrated draw solution comprising ammonia and carbon dioxide in a ratio of at least 1 to 1 on a first side of a semi-permeable membrane to a hydraulic pressure lower than its osmotic pressure;
 - introducing a portion of nearly deionized dilute working fluid on an opposite side of the semi-permeable membrane;
 - causing a portion of the dilute working fluid to flow through the semi-permeable membrane into the pressurized draw solution to create a flux that expands the volume of the draw solution, thereby creating a dilute draw solution;
 - inducing flow of the dilute draw solution through a turbine to produce power;
 - thermally separating ammonia and carbon dioxide from the dilute draw solution; and
 - recycling the ammonia and carbon dioxide to re-concentrate the concentrated draw solution.
2. The method according to claim 1, wherein the concentrated draw solution has an ammonia to carbon dioxide ratio of between about 1 to 1 and 2.5 to 1.
3. The method according to claim 1, wherein the concentrated draw solution has a concentration of between 0.1 and 12 molar.
4. The method according to claim 3, wherein the concentrated draw solution has a concentration of between about 3 to about 6 molar.
5. The method of claim 1, wherein thermally separating ammonia and carbon dioxide from the dilute draw solution comprises a gas stripping process.
6. The method of claim 5, wherein the gas stripping process comprises use of low temperature steam.

7. The method of claim 6, wherein the gas stripping process is performed at a temperature of between about 35°C and 250°C and a pressure of between about 0.05 atm and about 10 atm, wherein the temperature is proportional to the pressure.
8. The method of claim 1, wherein the flux is at least $25 \times 10^{-6} \text{ m}^3/\text{m}^2\text{-s}$.
9. An osmotic heat engine, comprising:
 - a membrane system comprising a semi-permeable membrane having a first side and an opposite side;
 - a source of a dilute working fluid fluidly connected to the opposite side of the membrane;
 - a source of a concentrated draw solution comprising ammonia and carbon dioxide in a ratio of at least 1 to 1 fluidly connected to the first side of the membrane;
 - a pressure exchanger to pressurize the concentrated draw solution;
 - a turbine fluidly connected to the membrane system downstream of the first side of the membrane;
 - a gas stripping operation fluidly connected downstream of the turbine; and
 - a recycle system fluidly connected to the first and opposite sides of the membrane.
10. The osmotic heat engine according to claim 9, wherein the concentrated draw solution has an ammonia to carbon dioxide ratio of between about 1 to 1 and 2.5 to 1.
11. The osmotic heat engine according to claim 10, wherein the concentrated draw solution has a concentration of between 0.1 and 12 molar.
12. The osmotic heat engine of claim 9, wherein the gas stripping operation-comprises a distillation column.
13. The osmotic heat engine of claim 12, further comprising a source of low grade heat thermally connected to the gas stripping operation.
14. The osmotic heat engine of claim 9, wherein power output per membrane area of the

osmotic heat engine is at least about 150 W/m^2 .