

~~What is eClaimsed:~~

1. A method for supplying NH_3 to an exhaust gas treatment system comprising:
producing ammonia by an electrolytic hydrolysis of urea effected by applying a voltage difference to an electrolytic cell comprising:
a cathode having a first conducting component,
an anode having a second conducting component,
urea, and
an alkaline electrolyte composition in electrical communication with the anode and the cathode, where the alkaline electrolyte composition has a hydroxide concentration of at least 0.01 M or a pH of at least 8,
wherein the voltage difference is applied across the cathode and the anode, wherein the voltage difference ~~is greater than about 0.85 volts and~~ is sufficient to effect the electrolytic hydrolysis of urea to produce at least NH_3 ;
recovering at least a portion of the NH_3 ; and
transferring the at least a portion of the NH_3 to the exhaust gas treatment system.
2. The method of claim 1, wherein the first conducting component comprises carbon, cobalt, copper, iridium, iron, nickel, palladium, platinum, rhodium, ruthenium, or mixtures or alloys thereof.
3. The method of claim 1, wherein the second conducting component comprises cobalt, copper, iridium, iron, platinum, nickel, rhodium, ruthenium, or mixtures or alloys thereof.
4. The method of claim 1, wherein the second conducting component comprises an oxidized form of cobalt, copper, iridium, iron, platinum, nickel, rhodium, ruthenium, or mixtures or alloys thereof.
5. The method of claim 1, wherein the voltage difference is within the range from about 0.85 volts to about 1.7 volts.

6. The method of claim 1, wherein the voltage difference is applied as a constant voltage.

5-7. The method of claim 1, wherein the exhaust gas treatment system includes at least one of a selective catalytic reduction system, a selective non-catalytic reduction system, or a flue gas conditioning system.

6-8. The method of claim 1, further comprising:
affecting a rate of NH_3 production by
varying at least one of
a temperature of the electrolytic cell,
a pressure of the electrolytic cell,
an electrical current applied to the electrolytic cell, or
a voltage applied to the electrolytic cell;
varying a voltage applied to a portion of the anode, wherein the anode comprises an anodic catalyst bed; or
varying an area percentage of a total area of the anodic catalyst bed contacting a urea solution.

7-9. The method of claim 1, wherein the alkaline electrolyte composition comprises an alkali metal or alkaline earth metal salt of a hydroxide, a carbonate, a bicarbonate, or combinations thereof.

8-10. The method of claim 1, wherein the electrolytic cell further comprises
a heater apparatus operatively coupled to electrolytic cell, and
a recirculation system operatively coupled to the electrolytic cell, wherein the recirculation system contains at least a portion of the alkaline electrolyte composition.

9-11. A method for reducing nitrogen oxide (NO_x) emissions and/or particulate matter in a combustion exhaust gas during ongoing operation, comprising:
injecting ammonia into the combustion exhaust gas upstream of at least one of a selective catalytic reduction (SCR) device, a selective non-catalytic reduction (SNCR) device, or an electrostatic precipitator device, wherein said ammonia is supplied by:
applying a voltage difference to an electrolytic cell comprised of:

a cathode having a first conducting component,
an anode having a second conducting component,
urea, and
an alkaline electrolyte composition in electrical communication
with the anode and the cathode, where the alkaline electrolyte
composition has a hydroxide concentration of at least 0.01 M or a pH of
at least 8,
wherein the voltage difference is applied across the cathode and the anode, and
wherein the voltage difference is greater than about 0.85 volts and is sufficient to
effect the electrolytic hydrolysis of urea to produce at least NH₃.

~~10-12.~~ The method of claim ~~9~~11, wherein the first conducting component comprises
carbon, cobalt, copper, iridium, iron, nickel, palladium, platinum, rhodium, ruthenium,
or mixtures or alloys thereof.

~~11-13.~~ The method of claim ~~9~~11, wherein the second conducting component comprises
cobalt, copper, iridium, iron, platinum, nickel, rhodium, ruthenium, or mixtures or
alloys thereof.

14. The method of claim 11, wherein the voltage difference is within the range from
about 0.85 volts to about 1.7 volts.

15. The method of claim 11, wherein the voltage difference is between about 1.2
volts and about 1.6 volts.

16. The method of claim 11, wherein applying the voltage difference to the
electrolytic cell further comprises varying the voltage difference to control the
production of NH₃.

17. The method of claim 11, wherein the electrolytic cell further comprises a
temperature control system including a heat source.

~~12-18.~~ The method of claim ~~9~~11 further comprising increasing a fuel combustion
efficiency of a combustion system, the method comprising:

supplying H₂ to a combustion chamber of the combustion system, wherein the hydrogen is supplied by:

applying the voltage difference to the electrolytic cell, wherein the voltage difference applied across the cathode and the anode is sufficient to produce NH₃ and H₂.

~~13-19.~~ An exhaust gas treatment system comprising:

at least one of a selective catalytic reduction system, a selective non-catalytic reduction system, or a flue gas conditioning system; and

an ammonia generator comprising an electrolytic cell comprised of:

a cathode having a first conducting component,

an anode having a second conducting component,

urea,

a voltage source ~~supplying a voltage to the electrolytic cell of greater than about 0.85 volts,~~

an alkaline electrolyte composition in electrical communication with the anode and the cathode, where the alkaline electrolyte composition has a hydroxide concentration of at least 0.01 M or a pH of at least 8; and

an ammonia outlet from the ammonia generator in communication with the at least one of the selective catalytic reduction system, the selective non-catalytic reduction system, or the flue gas conditioning system.

~~14-20.~~ The system of claim ~~13-19~~, wherein the first conducting component comprises carbon, cobalt, copper, iridium, iron, nickel, palladium, platinum, rhodium, ruthenium, or mixtures or alloys thereof.

~~15-21.~~ The system of claim ~~13-19~~, wherein the second conducting component comprises cobalt, copper, iridium, iron, platinum, nickel, rhodium, ruthenium, or mixtures or alloys thereof.

22. The system of claim 19, wherein the voltage difference is within the range from about 0.85 volts to about 1.7 volts.