CLAIMS

That which is claimed is:

1. A method of preparing catalyst for converting diesel type liquid hydrocarbons to methane rich gas , said process comprising the steps of:

adding stoichiometric amounts of $Ce(NO_3)_3 \cdot 6H_20$, $Gd(NO_3)_3 \cdot 6H_20$, and $Ni(NO_3)_3 \cdot 6H_20$ to de-ionized water to create a dissolved solution;

adding glycine to the dissolved solution to create a glycine-dissolved solution;

heating the glycine-dissolved solution such that excess water is evaporated, combustion is initiated, and a catalyst powder is produced; and

calcining the catalyst powder in air.

2. The method of claim 1 wherein the catalyst powder is shaped into a form for use in converting diesel type liquid hydrocarbons to methane rich gas.

3. The method of claim 2 wherein the form is catalyst pellets.

4. The method of any of the preceding claims, wherein the molar ratio of glycine to NO_3 of the glycine-dissolved solution is about 1.5.

5. The method of any of the preceding claims, wherein the catalyst powder has particles in the size range of about 10 nm to 20 nm.

6. The method of any of any of the preceding claims wherein calcining the catalyst powder step comprises increasing the temperature to 800°C over a period of 4 hours, and then maintaining the temperature at 800°C for 4 hours.

7. A method of activating a catalyst comprising the step of:

reducing the catalyst in an environment of hydrogen and nitrogen, the reduction occurring at 500°C for 4 hours, the catalyst including a nickel component, a cerium oxide component, and a gadolinium oxide component such that the catalyst is operable to convert diesel type liquid hydrocarbons to methane rich gas.

8. The method of claim 7 wherein the hydrogen is about 30% wt.

9. The method of either of claims 7 or 8 wherein the nitrogen is about 70% wt.

10. A method of regenerating a catalyst comprising the steps of:

treating the catalyst after the catalyst has been used for converting diesel type liquid hydrocarbons to methane rich gas with a treatment of water, hydrogen, and nitrogen at atmospheric pressure for a sufficient amount of time to remove coke formation on the catalyst, the catalyst including a nickel component, a cerium oxide component, and a gadolinium oxide component such that the catalyst is operable to convert diesel type liquid hydrocarbons to methane rich gas.

11. The method of claim 10 wherein the hydrogen is about 30% wt.

12. The method of either of claims 10 and 11 wherein the nitrogen is about 45% wt.

13. The method of any of claims 10 to 12 wherein the water is about 45% wt.

14. A method of using a catalyst 1 wherein

diesel type liquid hydrocarbons are applied to the catalyst and a methane rich gas is produced.

15. A catalyst comprising:

a nickel component,

a cerium oxide component,

and gadolinium oxide component,

said catalyst operable to convert diesel type liquid hydrocarbons to methane rich gas.

16. The catalyst of claim 15 further comprising ruthenium.

17. The catalyst of any of claim 15 and 16 wherein the nickel component is 20% wt., the cerium oxide component is 70% wt., and the gadolinium oxide component is 10% wt of the catalyst.

18. The catalyst of any of claim 15 and 16, wherein the nickel component is 19.5% wt., the cerium oxide component is 70% wt., the gadolinium oxide components is 10% wt, and the ruthenium component is 0.5% wt.

19. A catalyst for converting diesel type liquid hydrocarbons to methane rich gas, the catalyst comprising:

a nickel component,

a cerium oxide component,

and gadolinium oxide component,

said catalyst being resistant to the formation of coke on the catalyst during use of the catalyst and operable to convert diesel type liquid hydrocarbons to methane rich gas at a rate of 90% or greater.

CLAIMS

1. A method of preparing catalyst for converting diesel type liquid hydrocarbons to methane rich gas, said process comprising the steps of:

adding stoichiometric amounts of $Ce(NO_3)_3 \cdot 6H_20$, $Gd(NO_3)_3 \cdot 6H_20$, and $Ni(NO_3)_3 \cdot 6H_20$ to de-ionized water to create a dissolved solution;

adding glycine to the dissolved solution to create a glycine-dissolved solution;

heating the glycine-dissolved solution such that excess water is evaporated, combustion is initiated, and a catalyst powder is produced; and

calcining the catalyst powder in air at 800ºC for 4 hours.

2. The method of claim 1 wherein the catalyst powder is shaped into a form for use in converting diesel type liquid hydrocarbons to methane rich gas.

3. The method of claim 2 wherein the form is catalyst pellets.

4. The method of any of the preceding claims, wherein the molar ratio of glycine to NO_3 of the glycine-dissolved solution is about 1.5.

5. The method of any of the preceding claims, wherein the catalyst powder has particles in the size range of about 10 nm to 20 nm.

6. A method of activating a catalyst comprising the step of:

reducing the catalyst in an environment of hydrogen and nitrogen, the reduction occurring at 500ºC for 4 hours, the catalyst including a nickel component, a cerium oxide component, and a gadolinium oxide component such that the catalyst is operable to convert diesel type liquid hydrocarbons to methane rich gas.

7. The method of claim 6 wherein the hydrogen is about 30% wt.

8. The method of either of claims 6 or 7 wherein the nitrogen is about 70% wt.

9. A method of regenerating a catalyst comprising the steps of:

treating the catalyst after the catalyst has been used for converting diesel type liquid hydrocarbons to methane rich gas with a treatment of water, hydrogen, and nitrogen at atmospheric pressure for a sufficient amount of time to remove coke formation on the catalyst,

the catalyst including a nickel component, a cerium oxide component, and a gadolinium oxide component such that the catalyst is operable to convert diesel type liquid hydrocarbons to methane rich gas.

10. The method of claim 9 wherein the hydrogen is about 30% wt.

11. The method of either of claims 9 and 10 wherein the nitrogen is about 45% wt.

12. The method of any of claims 9 to 11 wherein the water is about 45% wt.

13. A method of using a catalyst prepared according to claim 1, further comprising the steps of:

reducing the catalyst in an environment of hydrogen and nitrogen, the reduction occurring at 500ºC for 4 hours, the catalyst including a nickel component, a cerium oxide component, and a gadolinium oxide component such that the catalyst is operable to convert diesel type liquid hydrocarbons to methane rich gas; and

producing a methane rich gas when diesel type liquid hydrocarbons are applied to the catalyst.

14. A catalyst comprising:

a nickel component,

a cerium oxide component,

and gadolinium oxide component,

said catalyst operable to convert diesel type liquid hydrocarbons to methane rich gas.

15. The catalyst of claim 14 further comprising ruthenium.

16. The catalyst of any of claim 14 wherein the nickel component is 20% wt., the cerium oxide component is 70% wt., and the gadolinium oxide component is 10% wt of the catalyst.

17. The catalyst of any of claim 14 and 15, wherein the nickel component is 19.5% wt., the cerium oxide component is 70% wt., the gadolinium oxide components is 10% wt, and the ruthenium component is 0.5% wt.

18. A catalyst for converting diesel type liquid hydrocarbons to methane rich gas, the catalyst comprising:

a nickel component,

a cerium oxide component,

and gadolinium oxide component,

said catalyst being resistant to the formation of coke on the catalyst during use of the catalyst and operable to convert diesel type liquid hydrocarbons to methane rich gas at a rate of 90% or greater.