Claims

1. A method of treating waste, the method comprising:
   - heating waste to generate inert gases and carbon dioxide;
   - pyrolysing the waste in the presence of the inert gases and carbon dioxide to form a mixture of hydrocarbons, wherein the pyrolysing is performed at a temperature of 400-1000°C;
   - catalytically dry reforming and/or steam reforming the mixture of hydrocarbons to form at least carbon monoxide and hydrogen; and
   - forming carbon nanomaterials from the carbon monoxide and hydrogen.

2. The method according to claim 1, wherein the waste is plastic waste, biomass, or a combination thereof.

3. The method according to claim 1 or 2, wherein the heating comprises combusting the waste.

4. The method according to any preceding claim, wherein the pyrolysing comprises catalytic or non-catalytic pyrolysing the waste.

5. The method according to any preceding claim, wherein the pyrolysing comprises catalytic pyrolysing the waste in the presence of a pyrolysis catalyst.

6. The method according to any preceding claim, wherein the dry reforming comprises dry reforming of the hydrocarbons with carbon dioxide to produce carbon monoxide and hydrogen gas.

7. The method according to claim 6, wherein the carbon dioxide is from the heating and pyrolysing.

8. The method according to any preceding claim, wherein the dry reforming is performed at a temperature of 400-1000°C.

9. The method according to any preceding claim, wherein the forming carbon nanomaterials comprises chemical vapour deposition of carbon nanomaterials from the carbon monoxide and hydrogen.

10. The method according to claim 9, wherein the chemical vapour deposition is in the presence of a catalyst.

11. The method according to any preceding claim, wherein the forming carbon nanomaterial is performed at a temperature of 450-1000°C.

12. The method according to any preceding claim, wherein the carbon nanomaterials formed in the forming carbon nanomaterials comprises: carbon nanotubes, carbon spheres, carbon fibres, amorphous carbon, graphene-based nanomaterials, or a combination thereof.

13. The method according to claim 12, wherein the carbon nanotubes are single-walled carbon nanotubes, multi-walled carbon nanotubes, or a combination thereof.

14. The method according to any preceding claim, further comprising treating any flue gas produced during the heating, pyrolysing, dry reforming, and/or forming.

15. A waste treatment system for treating waste according to the method of any preceding claim, comprising:

- an inlet for receiving waste;
- a heating chamber coupled to the inlet for heating the waste;
- a pyrolysis chamber for pyrolysing the waste, the pyrolysis chamber fluidically connected to the heating chamber;
- a dry reforming chamber fluidically connected to the pyrolysis chamber for dry reforming hydrocarbons formed in the pyrolysis chamber; and
- a chemical vapour deposition (CVD) chamber connected to the dry reforming chamber for forming carbon nanomaterials.

16. The system according to claim 15, further comprising a condensation system for condensing exhaust gases.

17. The system according to 15 or 16, further comprising a flue gas treatment system in fluid communication with the condensation system and/or CVD chamber for treating exhaust gases.

18. The system according to any of claims 15 to 17, further comprising a gas outlet for venting exhaust gases.

19. The system according to any of claims 15 to 18, wherein the heating chamber is fluidically connected to an air inlet.