Claims

1. Torrefaction unit (1) for the torrefaction of a material comprising biomass, comprising at least two multiple hearth furnaces (2), said multiple hearth furnaces (2) comprising a heating system (19) which can be flown through by a heat transfer fluid (16), wherein the heating system (19) is connected to a water circuit (20) by which water is heatable and conveyable through the heating system (19),

wherein a single partial oxidation reactor (23) is connected to the at least two multiple hearth furnaces (2).

2. The torrefaction unit (1) according to claim 1, wherein the single partial oxidation reactor (23) includes a burning chamber (4) being connected to the at least two multiple hearth furnaces (2) for the partial oxidation of torrefaction gas (3) with oxygen creating a syngas (8).

3. The torrefaction unit (1) according to one of the preceding claims, further comprising a steam drum (11) having a steam space (22) and a water space (21), wherein the water circuit (20) is connected to the water space (21) of the steam drum (11).

4. The torrefaction unit (1) according to claim 3, wherein the water space (21) and the steam space (22) of the steam drum (11) are in fluid connection with an evaporator (9) which is heatable by syngas (8) generated by partial oxidation of torrefaction gas (3).

5. The torrefaction unit (1) according to claim 3 or 4, wherein the steam space (22) of the steam drum (11) is in fluid connection with a superheater (13) which is heatable by syngas (8) generated by partial oxidation of torrefaction gas (3).

6. Method for the torrefaction of a material comprising biomass, wherein the material is heated to a torrefaction temperature in at least two multiple hearth furnaces (2), wherein the atmosphere in the at least two multiple hearth furnaces (2) is controlled to provide a substoichiometric amount of oxygen wherein the at least two multiple hearth furnaces (2) are heated by a heat transfer (16) fluid comprising water, wherein the torrefaction gas (3) of the at least two multiple hearth furnaces (2) is partially oxidized in a single partial oxidation reactor (23).

7. The method according to claim 6, wherein torrefaction gas (3) is generated by the torrefaction of the material, said torrefaction gas (3) being partially oxidized to generate a syngas (8).

8. The method according to one of claims 6 to 7, wherein the heat transfer fluid (16) comprises water taken from a steam drum (11).

9. The method according to claim 8, wherein the heat transfer fluid (16) is guided in a water circuit (20) from the steam drum (11) through a heating system (19) of the at least two multiple hearth furnaces (2) and back to the steam drum (11).

10. The method according to one of claims 8 to 9, wherein torrefaction gas (3) is generated by the torrefaction of the material, said torrefaction gas (3) being partially oxidized to generate a syngas (8), the syngas (8) being used to at least in part evaporate water (10) provided from a water space (21) of said steam drum (11), wherein the at least partly evaporated water (10) is provided to a steam space (22) of said steam drum (11) after evaporation.

11. The method according to one of claims 8 to 10, wherein torrefaction gas (3) is generated by the torrefaction of the material, said torrefaction gas (3) being partially oxidized to generate a syngas (8), the syngas (8) being used to superheat steam (12) provided from a steam space (22) of the steam drum (11).

12. The method according to one of claims 6 to 11, wherein the atmosphere in the at least one multiple hearth furnace (2) is controlled to provide an oxygen content of less than 1 vol.-%.