Claims

1. A gasification apparatus comprising:

a biomass pyrolyzing zone for heating biomass in a non-oxidizing atmosphere or an atmosphere of mixed gas of non-oxidizing gas and steam, and

a gas reforming zone for heating gas generated in the biomass pyrolyzing zone, in the presence of steam; and

a plurality of preheated granules and/or lumps being sequentially moved from the gas reforming zone to the biomass pyrolyzing zone to reform the gas generated by pyrolyzing the biomass and to pyrolyze the biomass, using heat of the granules and/or lumps,

wherein the biomass pyrolyzing zone and the gas reforming zone are comprised in a single vessel,

the gas reforming zone is disposed above the biomass pyrolyzing zone, and

at least one partitioning plate is further comprised between the biomass pyrolyzing zone and the gas reforming zone.

2. The gasification apparatus according to claim 1, wherein the at least one partitioning plate between the biomass pyrolyzing zone and the gas reforming zone comprises one or two partitioning plates.

3. The gasification apparatus according to claim 1 or 2, wherein

the partitioning plate has openings therein and/or defines a space from the inner wall of the vessel, and

the granules and/or lumps sequentially travel from the gas reforming zone to the biomass pyrolyzing zone through the openings and/or space.

4. The gasification apparatus according to any one of claims 1 to 3, further comprising at least one biomass inlet at the upper portion of the biomass pyrolyzing zone.

5. The gasification apparatus according to any one of claims 1 to 4, further comprising a plurality of staggered flow guides in the biomass pyrolyzing zone, the flow guides being aligned in a plurality of rows along a travelling direction of the granules and/or lumps from the vicinity of exits for the granules and/or lumps in the partitioning plate, the flow guides controlling the travelling direction of the granules and/or lumps, wherein

the biomass is fed to the granules and/or lumps traveling in the vicinity of the flow guides and is pyrolyzed.

6. The gasification apparatus according to any one of claims 1 to 4, further comprising a plurality of staggered flow guides in the biomass pyrolyzing zone, the flow guides being aligned in two to five rows along a travelling direction of the granules and/or lumps from the vicinity of exits for the granules and/or lumps in the partitioning plate, the flow guides controlling the travelling direction of the granules and/or lumps, wherein

the biomass is fed to the granules and/or lumps traveling in the vicinity of the flow guides and is pyrolyzed.

7. The gasification apparatus according to any one of claims 1 to 4,

further comprising a plurality of staggered flow guides in the biomass pyrolyzing zone, the flow guides being aligned in two to five rows along a travelling direction of the granules and/or lumps from the vicinity of exits for the granules and/or lumps in the partitioning plate, the flow guides controlling the travelling direction of the granules and/or lumps, wherein the biomass is fed to the granules and/or lumps traveling in the vicinity of the uppermost row of the flow guides and is pyrolyzed.

8. The gasification apparatus according to any one of claims 1 to 7, further comprising a steam inlet in the biomass pyrolyzing zone and/or the gas reforming zone.

9. The gasification apparatus according to any one of claims 1 to 8, further comprising a preheater at the upper portion of the gas reforming zone of the vessel comprising the gas reforming zone and the biomass pyrolyzing zone, the preheater heating the granules and/or lumps in advance.

10. The gasification apparatus according to any one of claims 1 to 8, wherein the granules and/or lumps are selected from the group consisting of metal spheres and ceramic spheres.

11. The gasification apparatus according to any one of claims 1 to 10, wherein the biomass is selected from the group consisting of plant biomass, biological biomass, domestic waste, and food waste.

Claims

1. A gasification apparatus comprising:

a biomass pyrolyzing zone for heating biomass in a non-oxidizing atmosphere or an atmosphere of mixed gas of non-oxidizing gas and steam, and

a gas reforming zone for heating gas generated in the biomass pyrolyzing zone, in the presence of steam; and

a plurality of preheated granules and/or lumps being sequentially moved from the gas reforming zone to the biomass pyrolyzing zone to reform the gas generated by pyrolyzing the biomass and to pyrolyze the biomass, using heat of the granules and/or lumps, wherein

the biomass pyrolyzing zone and the gas reforming zone are comprised in a single vessel,

the gas reforming zone is disposed above the biomass pyrolyzing zone, and

at least one partitioning plate is further comprised between the biomass pyrolyzing zone and the gas reforming zone, wherein

the gasification apparatus further comprises a plurality of staggered flow guides in the biomass pyrolyzing zone, the flow guides being aligned in a plurality of rows along a travelling direction of the granules and/or lumps from the vicinity of exits for the granules and/or lumps in the partitioning plate, the flow guides controlling the travelling direction of the granules and/or lumps, wherein

the biomass is fed to the granules and/or lumps traveling in the vicinity of the flow guides and is pyrolyzed.

2. The gasification apparatus according to claim 1, wherein the at least one partitioning plate between the biomass pyrolyzing zone and the gas reforming zone comprises one or two partitioning plates.

3. The gasification apparatus according to claim 1 or 2, wherein

the partitioning plate has openings therein and/or defines a space from the inner wall of the vessel, and

the granules and/or lumps sequentially travel from the gas reforming zone to the biomass pyrolyzing zone through the openings and/or space.

4. The gasification apparatus according to any one of claims 1 to 3, further comprising at least one biomass inlet at the upper portion of the biomass pyrolyzing zone.

5. The gasification apparatus according to any one of claims 1 to 4, further comprising a plurality of flow guides, the flow guides being aligned in two to five rows, the flow guides controlling the travelling direction of the granules and/or lumps.

6. The gasification apparatus according to any one of claims 1 to 4, further comprising a plurality of flow guides, the flow guides being aligned in two to five rows, the flow guides controlling the travelling direction of the granules and/or lumps, wherein

the biomass is fed to the granules and/or lumps traveling in the vicinity of the uppermost row of the flow guides and is pyrolyzed.

7. The gasification apparatus according to any one of claims 1 to 6, further comprising a steam inlet in the biomass pyrolyzing zone and/or the gas reforming zone.

8. The gasification apparatus according to any one of claims 1 to 7, further comprising a preheater at the upper portion of the gas reforming zone of the vessel comprising the gas reforming zone and the biomass pyrolyzing zone, the preheater heating the

granules and/or lumps in advance.

9. The gasification apparatus according to any one of claims 1 to 7, wherein the granules and/or lumps are selected from the group consisting of metal spheres and ceramic spheres.

10. The gasification apparatus according to any one of claims 1 to 9, wherein the biomass is selected from the group consisting of plant biomass, biological biomass, domestic waste, and food waste.