

CLAIMS

What is claimed is:

1. A reactor comprising:
a furnace;
a crucible positioned for heating by the furnace, the crucible defining an interior volume;
a downtube disposed at least partially within the interior crucible along an axis;
at least one structure coupled with the downtube and extending substantially across the cross-sectional area of the interior volume taken in a direction substantially perpendicular to the axis, the at least one structure having a plurality of holes formed therein enabling fluid flow through the at least one structure.
2. The reactor of claim 1, wherein the at least one structure coupled with the downtube includes a plurality of structures coupled with the downtube.
3. The reactor of claim 2, wherein the downtube includes a first opening at a first end of the downtube and a plurality of openings within a wall of the downtube adjacent the first opening.
4. The reactor of claim 3, wherein each of the plurality of openings is smaller than the first opening.
5. ~~The reactor of claim 4,~~ A reactor comprising:
a furnace;
a crucible positioned for heating by the furnace, the crucible defining an interior volume;

a downtube disposed at least partially within the interior crucible along an axis;

a plurality of structures, each structure of the plurality being coupled with the downtube and
extending substantially across the cross-sectional area of the interior volume taken in a
direction substantially perpendicular to the axis, each structure having a plurality of holes
formed therein enabling fluid flow through the structure, and wherein each structure of
 the plurality of structures includes a lower body portion and an upper body portion
 coupled with the lower body portion, wherein the plurality of holes is formed in the
 lower body portion ~~adjacent to and~~ at a location that is radially outward from a periphery
 of the upper body portion.

6. The reactor of claim 5, wherein at least one of the plurality of structures is
 formed from at least two differently sized pipe end caps.

7. The reactor of claim 5, further comprising a spool structure coupled with the
 crucible, the spool structure having at least one outlet and at least one inlet.

8. The reactor of claim 7, wherein a second end of the downtube is in fluid
 communication with the at least one inlet.

9. The reactor of claim 8, wherein the crucible, the downtube and the plurality of
 structures are each formed from a stainless steel material.

10. The reactor of claim 8, wherein at least one of the plurality of structures includes
 an additional opening sized and configured for receipt of a temperature measuring device
 therethrough.

11. The reactor of claim 8, wherein the furnace includes a plurality of selectively controllable heating zones.

12. The reactor of claim 1, wherein the at least one structure exhibits a substantially bell-shaped geometry.

~~13. A gas processing system comprising:~~

~~a supply of oxidizing material;~~

~~a supply of hydrocarbon material; and~~

~~a reactor comprising:~~

~~a furnace;~~

~~a crucible positioned for heating by the furnace, the crucible defining an interior volume and having a catalyst material therein;~~

~~a downtube disposed at least partially within the interior crucible along an axis, the downtube having a first end and a second end, the first end being in fluid communication with the supply of oxidizing material and the supply of hydrocarbon material, the second end providing an outlet into the interior volume of the crucible;~~

~~at least one structure coupled with the downtube and extending substantially across the cross-sectional area of the interior volume taken in a direction substantially perpendicular to the axis, the at least one structure having a plurality of holes formed therein enabling fluid flow through the at least one structure.~~

~~14. The system of claim 13, wherein the catalyst material includes a salt.~~

~~15. The system of claim 13, wherein the catalyst material includes sodium carbonate.~~

~~16. The system of claim 15, wherein the supply of oxidizing material includes water and wherein the supply of hydrocarbon material includes residual bitumen.~~

~~17. The system of claim 16, wherein the at least one structure includes a plurality of structures disposed at different elevations within the crucible.~~

~~18. The system of claim 17, wherein the downtube includes a first opening at the second end of the downtube and a plurality of openings within a wall of the downtube adjacent the first opening.~~

~~19. The system of claim 18, wherein each of the plurality of openings is smaller than the first opening.~~

~~20. The system of claim 19, wherein each structure of the plurality of structures includes a lower body portion and an upper body portion coupled with the lower body portion, wherein the plurality of holes is formed in the lower body portion at a location adjacent to and radially outward from a periphery of the upper body portion.~~

~~21. The system of claim 20, further comprising a spool structure coupled with the crucible, the spool structure having at least one outlet and at least one inlet, the first end of the downtube being coupled with the at least one inlet.~~

~~22. The system of claim 21, wherein the furnace includes a plurality selectively controllable heating zones.~~

~~23. The system of claim 22, further comprising at least one gas treatment system in fluid communication with the at least one outlet.~~

~~24. A column for use in the interior volume of a crucible of a reactor, the column comprising:
a downtube having a first end and a second end and extending along an axis;
at least one structure coupled with the downtube between the first end and the second end, the at least one structure comprising a body having a substantially concave surface and a plurality of openings formed within the body to enable fluid flow from one side of the at least one structure to another side of the at least one structure.~~

~~25. The column of claim 24, wherein the at least one structure further comprises:
a first body portion exhibiting a substantially cup-like shape and exhibiting a cross-sectional diameter of a first dimension;
a second body portion exhibiting a substantially cup-like shape and exhibiting a cross-sectional diameter of a second dimension, the second dimension being larger than the first dimension, wherein the first body portion is coupled to the second body portion along the axis in a concentric manner;
wherein the plurality of openings are formed in the second body portion at a location adjacent to and radially outward relative to a periphery of the first body portion.~~

~~26. The structure of claim 25, wherein the at least one structure exhibits a substantially bell-shaped geometry.~~

~~27. The structure of claim 25, wherein the at least one structure includes a plurality of structures coupled with the downtube at different locations between the first end and the second end.~~

~~28. A method of controlling a reaction within a reactor, the method comprising:
providing a salt bath within a crucible;
introducing an oxidizing material and a hydrocarbon material into the salt bath at a location near the lowest elevation of the crucible;
flowing gasses produced by at least one of the salt bath, oxidizing material and hydrocarbon material upward through the salt bath in an impeded manner.~~

~~29. The method according to claim 28, wherein providing a salt bath within a crucible includes providing a salt bath containing sodium carbonate.~~

~~30. The method according to claim 29, wherein introducing an oxidizing material and a hydrocarbon material into the salt bath includes introducing water and residual bitumen into the salt bath.~~

~~31. The method according to claim 30, wherein flowing gasses upward through the salt bath in an impeded manner includes placing at least one structure within an interior volume of the crucible such that it extends substantially through a cross-section thereof, the at least one structure having a substantially concave surface and a plurality of openings formed therein~~

~~enabling fluid communication from one side of the at least one structure to another side of the at least one structure.~~

~~32. The method according to claim 31, wherein placing at least one structure within an interior volume of the crucible includes placing a plurality of structures within the interior volume of the crucible at different elevations.~~

~~33. The method according to claim 28, wherein introducing an oxidizing material and a hydrocarbon material into the salt bath at a location near the lowest elevation of the crucible includes flowing the oxidizing material and the hydrocarbon material through a downtube, including flowing gasses produced by the oxidizing material and the hydrocarbon material through a plurality of openings in a sidewall of the downtube.~~