WHAT IS CLAIMED IS:

1. A sparger assembly (800) for a bioprocessing system (10, 210), comprising:

a first layer (806) having a plurality of pores (808) of a first size; and

a second layer (810) disposed above the first layer (806) and having a plurality of holes (812) of a second size, the second size being greater than the first size;

wherein the pores (808) of the first layer (806) and the holes (812) of the second layer (810) allow for the passage of a sparge gas (814) through the first layer (806) and the second layer (810); and

wherein the second layer (810) is gas and water permeable.

2. The sparger assembly (800) of claim 1, wherein:

the first size is sufficient to allow for passage of gas through the first layer (806), and to inhibit the passage of water through the first layer (806).

3. The sparger assembly (800) of claim 1 or 2, wherein:

the first layer (806) is hydrophobic and has a three-dimensionally interconnected pore structure.

4. The sparger assembly (800) of any preceding claim, wherein:

the first layer (806) is formed from a sintered hydrophobic material.

5. The sparger assembly (800) of any preceding claim, wherein the first layer (806) is formed from: a polymer material, polyethylene, polytetrafluoroethylene (PTFE), polypropylene, and/or fluorocarbons.

~~5~~6. The sparger assembly (800) of any preceding claim, wherein:

the second layer (810) has a plurality of discrete holes through the second layer.

~~6~~7. The sparger assembly (800) of claim ~~5~~6, wherein:

the second layer (810) is configured as a drilled hole sparging element.

~~7~~8. The sparger assembly (800) of any preceding claim, wherein:

the first size is between about 2 and about 20 micrometers in diameter; and/or~~.~~

~~8. The sparger assembly of any preceding claim, wherein:~~

the second size is between about 100 and about 500 micrometers in diameter.

9. The sparger assembly (800) of any preceding claim, further comprising:

a housing (802) receiving the first layer (806) and the second layer (810), the housing (802) being configured to receive a sparge gas (814) from a supply;

wherein the sparge gas (814) supplied to the housing (802) is permitted to pass through the first layer (806) and the second layer (810) into a bioprocessing vessel (20); and

wherein the first pore size of the first layer (806) is such that water is not permitted to pass from the bioprocessing vessel (20) past the first layer (806).

10. The sparger assembly (800) of any preceding claim, wherein:

the first layer (806) is gas permeable and water impermeable.

~~11. The sparger assembly of any preceding claim, wherein:~~

~~the second layer is gas and water permeable.~~

~~12.~~ 11. A bioprocessing system (10), comprising:

a vessel (12);

a flexible bioprocessing bag (20) positionable within the vessel (12); and

at least one sparger assembly (800) positioned at a bottom of the flexible bioprocessing bag (20), the sparger assembly (800) being as per the sparger assembly (800) of any preceding claim~~including:~~

~~a first layer having a plurality of pores of a first size; and~~

~~a second layer disposed above the first layer and having a plurality of holes of a second size, the second size being greater than the first size;~~

wherein the pores of the first layer and the holes of the second layer allow for the passage of a sparge gas through the first layer and the second layer.

13. The bioprocessing system of claim 12, wherein:
the first layer is gas permeable and water impermeable.

14. The bioprocessing system of claim 12 or 13, wherein:
the second layer is gas and water permeable.

15. The bioprocessing system of any one of claims 12-14, wherein:
the first layer is formed form a sintered hydrophobic material.

16. The bioprocessing system of any one of claims 12-15, wherein:
the second layer is configured as a drilled hole sparging element.

17. A sparger assembly, comprising:
a base layer;
a dielectric layer disposed above the base layer;
a top layer disposed above the dielectric layer, the top layer having an upper surface;
at least one electrode in contact with the dielectric layer; and
at least one sparge gas opening in at least the hydrophobic layer for facilitating the formation of a bubble of sparge gas on the upper surface of the top layer for introduction of the sparge gas into a bioreactor vessel.

18. The sparger assembly of claim 17, wherein:
the top layer is formed from a hydrophobic material.

19. The sparger assembly of claim 17 or 18, wherein:
the at least one electrode is electrically coupled to a voltage source;
wherein the voltage source is controllable to supply a voltage to the at least one electrode; and

wherein adjusting the voltage supplied to the at least one electrode varies a diameter of the bubble formed on the upper surface of the top layer.

20. The sparger assembly of any one of claims 17-19, wherein:

the at least one sparge gas opening is a plurality of openings including at least a first array of openings and a second array of openings; and

the at least one electrode is a plurality of electrodes including at least a first array of electrodes associated with the first array of openings and a second array of electrodes associated with the second array of openings.

21. The sparger assembly of any one of claims 17-20, wherein:

the at least one electrode is sandwiched between the base layer and the dielectric layer.

22. A bioprocessing system, comprising:

a vessel;

a flexible bioprocessing bag positionable within the vessel; and

a sparger assembly positioned at a bottom of the flexible bioprocessing bag, the sparger assembly including:

a base layer;

a dielectric layer disposed above the base layer;

a top layer disposed above the dielectric layer, the top layer having an upper surface;

at least one electrode in contact with the dielectric layer; and

at least one sparge gas opening in at least the hydrophobic layer for facilitating the formation of a bubble of sparge gas on the upper surface of the top layer for introduction of the sparge gas into a bioreactor vessel.

23. The bioprocessing system of claim 22, wherein:

the top layer is formed from a hydrophobic material.

24. The bioprocessing system of claim 22 or 23, wherein:

~~the at least one electrode is electrically coupled to a voltage source;~~

~~wherein the voltage source is controllable to supply a voltage to the at least one electrode; and~~

~~wherein adjusting the voltage supplied to the at least one electrode varies a diameter of the bubble formed on the upper surface of the top layer.~~

~~25. The bioprocessing system of any one of claims 22-24, wherein:~~

~~the at least one electrode is sandwiched between the base layer and the dielectric layer.~~

~~26. A method for bioprocessing, comprising the steps of:~~

~~positioning a sparger assembly in a bioreactor vessel, the sparger assembly having a base layer, a dielectric layer disposed above the base layer, a top layer disposed above the dielectric layer, the top layer having an upper surface, at least one electrode in contact with the dielectric layer, and at least one sparge gas opening in at least the hydrophobic layer for facilitating the formation of a bubble of sparge gas on the upper surface of the top layer for introduction of the sparge gas into the bioreactor vessel;~~

~~electrically connecting the at least one electrode to a voltage source; and~~

~~adjusting a voltage supplied to the at least one electrode to adjust a diameter of the bubble formed on the upper surface of the top layer.~~

~~27. The method according to claim 26, further comprising the step of:~~

~~fluidly connecting the sparger assembly to a supply of sparge gas.~~

~~28. The method according to claim 26 or 27, further comprising the steps of:~~

~~supplying the sparge gas to the sparger assembly to form a first bubble having a first diameter on the upper surface of the top layer; and~~

~~adjusting a voltage supplied to the at least one electrode to produce a second bubble having a second diameter on the upper surface of the top layer;~~

~~wherein the first diameter is different from the second diameter.~~

~~29. The method according to any one of claims 26-28, wherein:~~

~~the at least one opening is a plurality of openings including at least a first array of openings and a second array of openings; and~~

~~the at least one electrode is a plurality of electrodes including at least a first array of electrodes associated with the first array of openings and a second array of electrodes associated with the second array of openings; and~~

~~wherein the method further includes supplying a first voltage to the first array of electrodes to produce a plurality of bubbles having a first diameter, and supplying a second voltage that is different from the first voltage to the second array of electrodes to produce a plurality of bubbles having a second diameter that is different from the first diameter.~~

12. The bioprocessing system (10) of claim 11, further comprising at least one of: a magnetic drive (34) external to the vessel (12), a magnetic hub (30) and/or an impeller (28).

13. The bioprocessing system (10) of claim 11 or 12, wherein at least one of said at least one sparger assembly (800) forms part of an aeration manifold (112, 114, 212, 214, 510, 512) that is removably attachable to a base plate (110, 210) therein.

14. The bioprocessing system (10) of claim 13, wherein respective aeration manifolds (112, 114, 212, 214, 510, 512) are arc-shaped.

15. The bioprocessing system (10) of claim 13 or 14, wherein respective pairs of aeration manifolds (112, 114, 212, 214, 510, 512) are connected together.