CLAIMS

What is claimed is:

1. A method for producing electricity in a molten carbonate fuel cell, the method comprising:

passing an anode input stream comprising H_2, a reformable fuel, or a combination thereof into an anode gas collection volume, the anode gas collection volume being defined by an anode surface, a first separator plate, and an anode collector providing support between the anode surface and the separator plate;

introducing a cathode input stream comprising O_2 and CO_2 into a cathode gas collection volume, the cathode gas collection volume being defined by a cathode surface, a second separator plate, and a cathode collector providing support between the cathode surface and the second separator plate, the cathode gas collection volume having a flow cross-section based on a direction of flow of the cathode input stream;

operating the molten carbonate fuel cell at a transference of 0.97 or less and an average current density of 60 mA/cm^2 or more to generate electricity, an anode exhaust comprising H_2, CO, and CO_2, and a cathode exhaust comprising 2.0 vol% or less CO_2, 1.0 vol% or more H_2O, and 1.0 vol% or more O_2,

wherein the cathode gas collection volume is further defined by one or more baffles in contact with the second separator plate, the one or more baffles reducing an unblocked flow cross-section of the cathode gas collection volume by 10% or more.

2. The method of claim 1, wherein the transference is 0.95 or less~~, or 0.90 or less~~.

3. The method of claim 1, wherein the transference is 0.90 or less.

~~3.~~4. The method of any one of ~~the above~~ claims 1 to 3, wherein the cathode input stream comprises 5.0 vol% or less of CO_2, or wherein the cathode exhaust comprises 1.0 vol% or less of CO_2, or a combination thereof.

~~4.~~5. The method of any one of ~~the above~~ claims 1 to 4, wherein the one or more baffles reduce the unblocked flow cross-section by 10% to 80% ~~(or 25% to 80%, or 50% to 80%, or 10% to 50%, or 25% to 50%)~~.

6. The method of any one of claims 1 to 4, wherein the one or more baffles reduce the unblocked flow cross-section by 25% to 80%.

7. The method of any one of claims 1 to 4, wherein the one or more baffles reduce the unblocked flow cross-section by 50% to 80%.

8. The method of any one of claims 1 to 4, wherein the one or more baffles reduce the unblocked flow cross-section by 10% to 50%.

9. The method of any one of claims 1 to 4, wherein the one or more baffles reduce the unblocked flow cross-section by 25% to 50%.

~~5.~~10. The method of any one of ~~the above~~ claims 1 to 9, wherein the one or more baffles are aligned substantially perpendicular to a direction of flow in the cathode gas collection volume.

~~6.~~11. The method of any one of ~~the above~~ claims 1 to 10, wherein an open area of the cathode surface is 50% or less~~, or 45% or less, or 40% or less~~.

12. The method of any one of claims 1 to 10, wherein an open area of the cathode surface is 45% or less.

13. The method of any one of claims 1 to 10, wherein an open area of the cathode surface is 40% or less.

~~7.~~14. The method of any one of claims ~~1—5~~ 1 to 10, wherein an open area of the cathode surface is 45% or more~~, or 50% or more, or 60% or more~~.

15. The method of any one of claims 1 to 10, wherein an open area of the cathode surface is 50% or more.

16. The method of any one of claims 1 to 10, wherein an open area of the cathode surface is 60% or more.

~~8.~~17. The method of any one of ~~the above~~ claims 1 to 16, wherein the cathode collector comprises the one or more baffles; or wherein the one or more baffles are attached to the second separator plate.

~~9.~~18. The method of any one of ~~the above~~ claims 1 to 17,

a) wherein the voltage drop across the cathode is 0.4 V or less;

b) wherein the electricity is generated at a voltage of 0.55 V or more;

c) wherein a H_2 concentration in the anode exhaust is 5.0 vol% or more;

d) wherein a combined concentration of H_2 and CO in the anode exhaust is 6.0 vol% or more;

e) a combination of two or more of a) – to d); or

f) a combination of three or more of a) – to d).

~~10.~~19. The method of any one of ~~the above~~ claims 1 to 18, wherein a fuel utilization in the anode is 60% or more, or wherein a fuel utilization in the anode is 55% or less.

~~11.~~20. A molten carbonate fuel cell, comprising:

an anode;

a first separator plate;

an anode collector in contact with the anode and the first separator plate to define an anode gas collection volume between the anode and the first separator plate;

a cathode;

a second separator plate;

a cathode collector in contact with a cathode surface of the cathode and the second separator plate to define a cathode gas collection volume between the cathode and the second separator plate, the cathode gas collection volume being in fluid communication with a cathode inlet;

one or more baffles in contact with the second separator plate, the one or more baffles reducing an unblocked flow cross-section of the cathode gas collection volume by 10% or more; and

an electrolyte matrix comprising an electrolyte between the anode and the cathode.

~~12.~~21. The molten carbonate fuel cell of claim ~~11~~ 20, wherein the one or more baffles reduce the unblocked flow cross-section by 10% to 80% ~~(or 25% to 80%, or 50% to 80%, or 10% to 50%, or 25% to 50%)~~.

22. The molten carbonate fuel cell of claim 20, wherein the one or more baffles reduce the unblocked flow cross-section by 25% to 80%.

23. The molten carbonate fuel cell of claim 20, wherein the one or more baffles reduce the unblocked flow cross-section by 50% to 80%.

24. The molten carbonate fuel cell of claim 20, wherein the one or more baffles reduce the unblocked flow cross-section by 10% to 50%.

25. The molten carbonate fuel cell of claim 20, wherein the one or more baffles reduce the unblocked flow cross-section by 25% to 50%.

~~13.~~26. The molten carbonate fuel cell of ~~claim 11 or 12~~ any one of claims 20 to 25, wherein the one or more baffles are aligned substantially perpendicular to a direction of flow in the cathode gas collection volume.

~~14.~~27. The molten carbonate fuel cell of any one of claims ~~11 — 13~~ 20 to 26, wherein an open area of the cathode surface is 50% or less~~, or 45% or less, or 40% or less; or wherein an open area of the cathode surface is 45% or more, or 50% or more, or 60% or more~~.

28. The molten carbonate fuel cell of any one of claims 20 to 26, wherein an open area of the cathode surface is 45% or less.

29. The molten carbonate fuel cell of any one of claims 20 to 26, wherein an open area of the cathode surface is 40% or less.

30. The molten carbonate fuel cell of any one of claims 20 to 26, wherein an open area of the cathode surface is 45% or more.

31. The molten carbonate fuel cell of any one of claims 20 to 26, wherein an open area of the cathode surface is 50% or more.

32. The molten carbonate fuel cell of any one of claims 20 to 26, wherein an open area of the cathode surface is 60% or more.

~~15.~~33. The molten carbonate fuel cell of any one of claims ~~11 14~~ 20 to 32, wherein the cathode collector comprises the one or more baffles; or wherein the one or more baffles are attached to the second separator plate.