## CLAIMS

1. A hydrogen gas purifier cell comprising:

a first membrane electrode assembly (MEA) comprising:

a first anode positioned to contact a first gas stream having a first hydrogen gas content and a first impurity gas content, the first anode containing a catalyst adapted to oxidize at least some of first hydrogen gas content to produce hydrogen ions and electrons;

a first electrolyte positioned and adapted to receive and transfer at least some of the hydrogen ions produced by the first anode; and

a first cathode positioned to receive at least some of the hydrogen ions transferred by the first electrolyte, the first cathode containing a catalyst adapted to reduce the at least some of the hydrogen ions to produce a second gas stream having a second hydrogen gas content greater than the first hydrogen gas content and a second impurity gas content less than the first impurity gas content;

a second MEA comprising:

a second anode positioned adjacent the first cathode to receive the second gas stream from the first cathode of the first MEA, the second anode containing a catalyst adapted to oxidize at least some of second hydrogen gas content in the second gas stream to produce hydrogen ions and electrons;

a second electrolyte positioned and adapted to receive and transfer at least some of the hydrogen ions produced by the second anode; and

a second cathode positioned to receive at least some of the hydrogen ions transferred by the second electrolyte of the second MEA, the second cathode containing a catalyst adapted to reduce the at least

some of the hydrogen ions to produce a third gas stream having a third hydrogen gas content greater than the first hydrogen gas content and a third impurity gas content less than the first impurity gas content.

2. The hydrogen gas purifier cell as recited in claim 1, wherein the purifier cell further comprises at least one passage between the first electrolyte and the second electrolyte for discharging at least some of the second gas stream.

3. The hydrogen gas purifier cell as recited in claim 2, wherein the at least one passage is located between the first cathode and the second anode.

4. The hydrogen gas purifier cell as recited in claim 3, wherein the at least one passage located between the first cathode and the second anode comprises voids between mating surfaces of the first cathode and the second anode.

5. The hydrogen gas purifier cell as recited in claim 3, wherein the purifier cell further comprises a gas-permeable layer (GDL) between the first cathode and the second anode, and wherein the GDL provides the at least one passage located between the first cathode and the second anode.

6. The hydrogen gas purifier cell as recited in claim 5, wherein the GDL comprises a carbon-based, gas-permeable layer.

7. The hydrogen gas purifier cell as recited in any one of claims 2 to 6, wherein the at least one passage comprises at least one channel in close proximity to at least one of the first cathode and the second anode.

8. The hydrogen gas purifier cell as recited in any one of claims 1 to 7, wherein the purifier cell further comprises at least one passage between the first electrolyte and the second electrolyte for introducing hydrogen-containing gas to the second gas stream.

9. The hydrogen gas purifier cell as recited in claim 8, wherein the at least one passage is located between the first cathode and the second anode.

10. The hydrogen gas purifier cell as recited in claim 9, wherein the at least one passage located between the first cathode and the second anode comprises voids between mating surfaces of the first cathode and the second anode.

11. The hydrogen gas purifier cell as recited in claim 1, wherein the second gas stream passes directly from the first cathode to the second anode.

12. The hydrogen gas purifier cell as recited in claim 11, wherein the second gas stream passes directly from the first cathode to the second anode without passing out of the hydrogen gas purifier cell.

13. The hydrogen gas purifier cell as recited in claim 1, wherein the spacing between the second anode and the first cathode is minimal.

14. The hydrogen gas purifier cell as recited in claim 1, wherein the spacing between the second anode and the first cathode is 0.1 mm to 0.5 mm.

15. The hydrogen gas purifier cell as recited in claim 1, wherein the second anode contacts the first cathode.

16. The hydrogen gas purifier cell as recited in claim 1, wherein the second gas stream passes from the first cathode to the second anode without any intervening handling.

17. A hydrogen gas purifier cell comprising:

a first membrane electrode assembly (MEA) comprising:

a first anode positioned to contact a first gas stream having a first hydrogen gas content and a first impurity gas content, the first anode containing a catalyst adapted to oxidize at least some of first hydrogen gas content to produce hydrogen ions and electrons;

a first electrolyte positioned and adapted to receive and transfer at least some of the hydrogen ions produced by the first anode; and

a first cathode positioned to receive at least some of the hydrogen ions transferred by the first electrolyte, the first cathode containing a catalyst adapted to reduce the at least some of the hydrogen ions to produce a second gas stream having a second hydrogen gas content greater than the first hydrogen gas content and a second impurity gas content less than the first impurity gas content;

a second MEA comprising:

a second anode positioned to receive the second gas stream from the first cathode of the first MEA, the second anode containing a catalyst adapted to oxidize at least some of second hydrogen gas content in the second gas stream to produce hydrogen ions and electrons;

a second electrolyte positioned and adapted to receive and transfer at least some of the hydrogen ions produced by the second anode; and

a second cathode positioned to receive at least some of the hydrogen ions transferred by the second electrolyte of the second MEA, the second cathode containing a catalyst adapted to reduce the at least some of the hydrogen ions to produce a third gas stream having a third hydrogen gas content greater than the first hydrogen gas content and a third impurity gas content less than the first impurity gas content; and

at least one passage between the first electrolyte and the second electrolyte for discharging at least some of the second gas stream, the at least one passage comprising voids between mating surfaces of the first cathode and the second anode.

18. The hydrogen gas purifier cell as recited in claim 11, wherein the purifier cell further comprises at least one passage between the first electrolyte and the second electrolyte for introducing the hydrogen-containing gas to the second gas stream.

19. The hydrogen gas purifier cell as recited in claim 18, wherein the at least one passage between the first electrolyte and the second electrolyte for introducing hydrogen-containing gas to the second gas stream comprises the voids between the mating surfaces of the first cathode and the second anode.

20. A hydrogen gas purifier cell comprising:

a first membrane electrode assembly (MEA) comprising:

a first anode positioned to contact a first gas stream having a first hydrogen gas content and a first impurity gas content, the first anode containing a catalyst adapted to oxidize at least some of first hydrogen gas content to produce hydrogen ions and electrons;

a first electrolyte positioned and adapted to receive and transfer at least some of the hydrogen ions produced by the first anode; and

a first cathode positioned to receive at least some of the hydrogen ions transferred by the first electrolyte, the first cathode containing a catalyst adapted to reduce the at least some of the hydrogen ions to produce a second gas stream having a second hydrogen gas content greater than the first hydrogen gas content and a second impurity gas content less than the first impurity gas content;

a second MEA comprising:

a second anode positioned to receive the second gas stream from the first cathode of the first MEA, the second anode containing a catalyst adapted to oxidize at least some of second hydrogen gas content in the second gas stream to produce hydrogen ions and electrons;

a second electrolyte positioned and adapted to receive and transfer at least some of the hydrogen ions produced by the second anode; and

a second cathode positioned to receive at least some of the hydrogen ions transferred by the second electrolyte of the second MEA, the second cathode containing a catalyst adapted to reduce the at least some of the hydrogen ions to produce a third gas stream having a third hydrogen gas content greater than the first hydrogen gas content and a third impurity gas content less than the first impurity gas content; and

at least one passage between the first electrolyte and the second electrolyte for introducing hydrogen-containing gas to the second gas stream, the at least one passage comprising voids between mating surfaces of the first cathode and the second anode.

21. The hydrogen gas purifier cell as recited in claim 20, wherein the purifier cell further comprises at least one passage between the first electrolyte and the second electrolyte for discharging at least some of the second gas stream.

22. The hydrogen gas purifier cell as recited in claim 21, wherein the at least one passage between the first electrolyte and the second electrolyte for discharging at least some of the second gas stream comprises the voids between the mating surfaces of the first cathode and the second anode.