CLAIMS

What is claimed is:

1. An electrochemical cell for performing electrochemical analysis, the electrochemical cell comprising:

a plurality of working electrode zones disposed, and defining a pattern, on a surface of the cell; and

at least one auxiliary electrode disposed on the surface, the at least one auxiliary electrode having a redox couple confined to its surface,

wherein the at least one auxiliary electrode is disposed at an approximate equal distance from at least two of the plurality of working electrode zones.

2. The electrochemical cell of claim 1, wherein, during the electrochemical analysis, the auxiliary electrode has a potential defined by the redox couple.

3. The electrochemical cell of claim 2, wherein the potential ranges from approximately 0.1 volts (V) to approximately 3.0 V.

4. The electrochemical cell of claim 3, wherein the potential is approximately 0.22 V.

5. The electrochemical cell of claim 1, wherein the pattern minimizes a number of working electrode zones that are adjacent to one another for each of the working electrode zones among the plurality of working electrode zones.

6. The electrochemical cell of claim 1, wherein the pattern is configured to provide uniform mass transport of a substance to each of the plurality of working electrode zones under conditions of rotational shaking.

7. The electrochemical cell of claim 1, wherein each of the plurality of working electrode zones defines a circular shape having surface area that defines a circle.

8. The electrochemical cell of claim 7, wherein:

the at least one auxiliary electrode is disposed at an approximate center of the electrochemical cell,

the plurality of working electrode zones includes ten working electrode zones spaced approximately equidistant from the at least one auxiliary electrode, and

two working electrode zones have a greater pitch distance therebetween than a remainder of the working electrode zones.

9. The electrochemical cell of claim 1, wherein the redox couple comprises a mixture of silver (Ag) and silver chloride (AgCl).

10. The electrochemical cell of claim 9, wherein the mixture of Ag and AgCl comprises approximately 50 percent or less AgCl.

11. The electrochemical cell of claim 10, wherein the mixture has a molar ratio of Ag to AgCl within a specified range.

12. The electrochemical cell of claim 9, wherein, during the electrochemical analysis the auxiliary electrode has a potential defined by the redox couple, and

wherein the potential is approximately 0.22 volts (V).

13. The electrochemical cell of claim 1, wherein the electrochemical analysis comprises electrochemiluminescence (ECL) analysis.

14. An electrochemical cell for performing electrochemical analysis, the electrochemical cell comprising:

a plurality of working electrode zones disposed, and defining a pattern, on a surface of the cell; and

at least one auxiliary electrode disposed on the surface, the auxiliary electrode having a defined interfacial potential.

15. The electrochemical cell of claim 14, wherein an amount of an oxidizing agent in the at least one auxiliary electrode is greater than or equal to an amount of charge required to pass through the at least one auxiliary electrode to complete the electrochemical analysis.

16. The electrochemical cell of claim 15, wherein the at least one auxiliary electrode has between approximately 3.07×10^{-7} to 3.97×10^{-7} moles of oxidizing agent.

17. The electrochemical cell of claim 15, wherein the at least one auxiliary electrode has between approximately 1.80×10^{-7} to 2.32×10^{-7} moles of oxidizing agent per mm^2 of auxiliary electrode area.

18. The electrochemical cell of claim 15, wherein the at least one auxiliary electrode has at least approximately 3.7×10^{-9} moles of oxidizing agent per mm^2 of total working electrode area in the well.

19. The electrochemical cell of claim 14, wherein the plurality of working electrode zones have an aggregate exposed area, the at least one auxiliary electrode has an exposed surface area, and the aggregate exposed area of the plurality of working electrode zones divided by the exposed surface area of the at least one auxiliary electrode define an area ratio that has a value greater than 1.

20. The electrochemical cell of claim 14, wherein the at least one auxiliary electrode comprises a mixture of silver (Ag) and silver chloride (AgCl).

21. The electrochemical cell of claim 20, wherein the mixture of Ag and AgCl comprises approximately 50 percent or less AgCl.

22. The electrochemical cell of claim 20, wherein the mixture has a molar ratio of Ag to AgCl within a specified range.

23. The electrochemical cell of claim 22, wherein the molar ratio is approximately equal to or greater than 1.

24. The electrochemical cell of claim 14, wherein the electrochemical cell is part of a flow cell.

25. The electrochemical cell of claim 14, wherein the electrochemical cell is part of a plate.

26. The electrochemical cell of claim 14, wherein the electrochemical cell is part of a cartridge.

27. An apparatus for performing electrochemical analysis, the apparatus comprising:

a plate with a plurality of wells defined therein, at least one well from the plurality of wells comprising:

a plurality of working electrode zones disposed, and defining a pattern, on a surface of the cell; and

at least one auxiliary electrode disposed on the surface and formed of a chemical mixture comprising an oxidizing agent,

the at least one auxiliary electrode having a redox couple confined to its surface, wherein an amount of the oxidizing agent is sufficient to maintain the defined potential throughout an entire redox reaction of the redox couple.

28. The apparatus of claim 27, wherein the redox couple passes approximately 0.5 to 4.0 mA of current throughout a redox reaction of the redox couple to generate electrochemiluminescence (ECL) at a range of approximately 1.4V to 2.6V.

29. The apparatus of claim 27, wherein the redox couple passes an average current of approximately 2.39 mA throughout a redox reaction to generate electrochemiluminescence (ECL) at a range of approximately 1.4 to 2.6 V.

30. The apparatus of claim 27, wherein the redox couple maintains an interface potential of between -0.15 to -0.5 V while passing a charge of approximately $1.56x10^{-5}$ to $5.30x10^{-4}$ C/mm^2 of electrode surface area.

31. The apparatus of claim 27, wherein the number of working electrode zones that are adjacent to one another is no greater than two.

32. The apparatus of claim 27, wherein at least one of the plurality of working electrode zones is adjacent to three or more other working electrode zones among the plurality of working electrode zones.

33. The apparatus of claim 27, wherein the pattern comprises a geometric pattern.

34. A method for electrochemical analysis, the method comprising:

applying a voltage pulse to one or more working electrode zones and at least one auxiliary electrode located in at least one well of a multi-well plate, wherein:

the one or more working electrode zones define a pattern on a surface of the at least one well,

the at least one auxiliary electrode is disposed on the surface and has a redox couple confined to its surface, and

the redox couple is reduced at least during a period for which the voltage pulse is applied.

35. The method of claim 34, wherein the luminescence data is captured during a duration of the voltage pulse.

36. The method of claim 35, wherein the luminescence data is captured during at least 50 percent of the duration of the voltage pulse.

37. The method of claim 35, wherein the luminescence data is captured during at least 75 percent of the duration of the voltage pulse.

38. The method of claim 35, wherein the luminescence data is captured during at least 100 percent of the duration of the voltage pulse.

39. The method of claim 34, wherein a duration of the voltage pulse is less than or equal to approximately 200 milliseconds (ms).

40. The method of claim 39, wherein the duration of the voltage pulse is approximately 100 ms.

41. The method of claim 39, wherein the duration of the voltage pulse is approximately 50ms.

42. The method of claim 34, wherein the voltage pulse is applied to the one or more working electrodes and the at least one auxiliary electrode concurrently.

43. The method of claim 34, wherein the voltage pulse is applied to the one or more working electrodes and the at least one auxiliary electrode sequentially.

44. The method of claim 34, wherein the voltage pulse is applied to an addressable subset of the one or more working electrode zones.

45. The method of claim 34, the method further comprising:

selecting a magnitude of the voltage pulse based at least in part on a chemical composition of the at least one auxiliary electrode.

46. A computer readable medium storing instructions that cause one or more processors to perform the method of claim 34.

47. An apparatus for performing electrochemical analysis in a well, the apparatus comprising:

a plurality of working electrode zones disposed on a surface adapted to form a bottom portion of the well; and

an auxiliary electrode disposed on the surface, the auxiliary electrode having a potential defined by a redox couple confined to its surface,

wherein one of the plurality of working electrode zones is disposed at an approximate equal distance from each sidewall of the well.

48. The apparatus of claim 47, wherein the plurality of working electrode zones comprises a plurality of electrically isolated zones formed on a single electrode.

49. The apparatus of claim 47, wherein the electrochemical analysis comprises electrochemiluminescence (ECL) analysis.

~~50. A method for performing electrochemical analysis, the method comprising:~~

~~applying a first voltage pulse to one or more working electrode zones or a counter electrode in a well of an apparatus, the first voltage pulse causing a first redox reaction to occur in the well;~~

~~capturing first luminescence data from the first redox reaction over a first period of time;~~

~~applying a second voltage pulse to the one or more working electrode zones or the counter electrode in the well, the second voltage pulse causing a second redox reaction to occur in the well; and~~

~~capturing second luminescence data from the second redox reaction over a second period of time.~~

~~51. The method of claim 50, the method further comprising:~~

performing electrochemical luminescence analysis on the first luminescence data and the second luminescence data.

52. The method of claim 50, wherein at least one of the first voltage pulse and the second voltage pulse is applied to an addressable subset of the one or more working electrode zones.

53. The method of claim 50, the method further comprising:

selecting a magnitude of at least one of the first voltage pulse and the second voltage pulse based at least in part on a chemical composition of the counter electrode, wherein the counter electrode is an auxiliary electrode.

54. The method of claim 50, wherein a first duration of the first period time is not equal to a second duration of the second period of time.

55. The method of claim 54, wherein the first duration and the second duration are selected to improve a dynamic range of an electrochemical luminescence analysis performed on the first luminescence data and the second luminescence data.

56. The method of claim 54, wherein the first luminescence data is captured during first duration of the first voltage pulse.

57. The method of claim 54, wherein one of the first duration or the second duration is less than or equal to approximately 200 milliseconds (ms).

58. The method of claim 57, wherein one of the first duration or the second duration is approximately 100 ms.

59. The method of claim 57, wherein one of the first duration or the second duration is approximately 50 ms.

~~60. The method of claim 50, wherein the counter electrode comprises an auxiliary electrode.~~