CLAIMS

WHAT IS CLAIMED IS:

1. An analysis system comprising:

an apparatus for reversibly coupling an interface device to a sensor device, wherein the interface device includes a fluidic interface between a fluid source and a flow cell formed upon coupling the interface device to the sensor device;

a thermal control assembly for thermal regulation of the sensor device;

a reference electrode in fluid communication with the sensor device, wherein the reference electrode provides a stable reference potential to an array of sensors of the sensor array device; and

a fluidic system configured for controllable liquid deliver through the flow cell.

2. The analysis system of claim 1, wherein the thermal control assembly provides thermal regulation of the sensor device over a range of temperatures from 4 °C to 60°C within +/ 0.1 °C.

3. The analysis system of claim 1, wherein the analysis system further comprises an array controller configured to provide power and bias voltages, as well as control and timing signals to the sensor device, and provide data acquired from the sensor array device to a system processor.

4. The analysis system of claim 1, wherein the analysis system further includes a microscope assembly.

5. The analysis system of claim 4, wherein the interface device further provides an optical interface between the microscope assembly and the sensor device.

6. The analysis system of claim 1, further comprising:

an analysis compartment housing the apparatus and the thermal control assembly;

a reagent and solution compartment; and

an environmental control system for thermal regulation of the analysis compartment and the reagent and solution compartment.

~~7. The analysis system of claim 6, wherein the environmental control system provides thermal regulation of the analysis compartment over a range of temperatures from 32 °C to 60 °C within +/- 0.5 °C.~~

~~8. The analysis system of claim 6, wherein the environmental control system provides thermal regulation of the reagent and solution compartment over a range of temperatures from 20 °C to 37 °C within +/- 0.3 °C.~~

~~9. The analysis system of claim 1, wherein the sensor device includes an array of ChemFET sensors.~~

~~10. The analysis system of claim 9, wherein each ChemFET sensor in the array of sensors has an input capacitance of between 1 fF to about 10 fF.~~

~~11. The analysis system of claim 9, wherein the array of sensors has a pitch of between 850 nm to 3.3 µ.~~

~~12. The analysis system of claim 9, wherein the ChemFET sensors are ion selective field effect transistor (ISFET) sensors.~~

~~13. The analysis system of claim 12, wherein the ISFET sensors are selective for hydrogen ion.~~

~~14~~1. A sensor device comprising:

an array of ChemFET sensors mounted on a substrate, wherein the ChemFET sensors have a pitch of between 850 nm to 3.3 µ and an input capacitance of between 1 fF to 10 fF; and

a frame mounted on the substrate; the frame having an inner wall surface that is a sealing surface enabling reversible formation of a flow cell.

~~15~~2. The sensor device of claim ~~14~~1, wherein the sensor device has a frame rate of between of between 15 fps to about 120 fps.

~~16~~3. The sensor device of claim ~~14~~1, wherein the array of ChemFET sensors is an array of ISFET sensors.

~~17~~4. The sensor device of claim ~~16~~3, wherein the ISFET sensors are selective for hydrogen ion.

~~185~~. The sensor device of claim ~~141~~, wherein the sensor device further comprises an array of microwells capacitively coupled to the sensor array.

~~196~~. The sensor array of claim ~~141~~, further comprising a removable cover fitting over the frame.

~~207~~. The sensor device of claim ~~141~~, further including a sample divider for providing isolated areas of the sensor array for plating each of a spatially divided sample of cells.

~~218~~. The sensor device of claim ~~207~~, wherein the sensor array further comprises a biocompatible surface coating.

~~229~~. The sensor device of claim ~~218~~, wherein the biocompatible coating is selected from fibronectin, poly-D-lysine, laminin, collagen, extracellular matrix and combinations thereof.

10. An analysis system comprising:

an apparatus for reversibly coupling an interface device to the sensor device of any one of claims 1-9, wherein the interface device includes a fluidic interface between a fluid source and a flow cell formed upon coupling the interface device to the sensor device;

a thermal control assembly for thermal regulation of the sensor device;

a reference electrode in fluid communication with the sensor device, wherein the reference electrode provides a stable reference potential to an array of sensors of the sensor array device; and

a fluidic system configured for controllable liquid deliver through the flow cell.

11. The analysis system of claim 10, wherein the thermal control assembly provides thermal regulation of the sensor device over a range of temperatures from 4°C to 60°C within +/-0.1°C.

12. The analysis system of claim 10, wherein the analysis system further comprises an array controller configured to provide power and bias voltages, as well as control and timing signals to the sensor device, and provide data acquired from the sensor array device to a system processor.

13. The analysis system of claim 10, wherein the analysis system further includes a microscope assembly.

14. The analysis system of claim 13, wherein the interface device further provides an optical interface between the microscope assembly and the sensor device.

15. The analysis system of claim 10, further comprising:

an analysis compartment housing the apparatus and the thermal control assembly;

a reagent and solution compartment; and

an environmental control system for thermal regulation of the analysis compartment and the reagent and solution compartment.

16. The analysis system of claim 15, wherein the environmental control system provides thermal regulation of the analysis compartment over a range of temperatures from 32°C to 60°C within +/- 0.5°C.

17. The analysis system of claim 15, wherein the environmental control system provides thermal regulation of the reagent and solution compartment over a range of temperatures from 20°C to 37°C within +/- 0.3°C.

~~23. A method for cell analysis comprising:~~

~~subjecting a first sample of cells plated on a first sensor device to a glucose-restriction pretreatment;~~

~~subjecting a second sample of cells plated on a second sensor device to a glucose-restriction pretreatment with koningic acid;~~

~~initiating an experiment on an analysis system for each of the first sensor device and second sensor device within two to three hours after a pretreatment;~~

~~reintroducing glucose for each of the first sample of cells and the second sample of cells; and~~

~~determining whether or not a metabolic profile of cell response is glycolytic in origin by comparing results derived from the first sensor device and second sensor device.~~

~~24. The method of claim 23, after reintroducing glucose, the method further comprising:~~

~~introducing a first agent for decoupling oxidative metabolism from the metabolic profile of cell response;~~

~~sequentially introducing a second agent for decoupling glycolytic metabolism from the metabolic profile of cell response; and~~

~~determining each of a contribution of oxidative metabolism and glycolytic metabolism to the metabolic profile by comparing results derived from the first sensor device and second sensor device.~~

~~25. The method of claim 24, wherein the first agent is oligomycin, antimycin A, rotenone, or metformin.~~

~~26. The method of claim 24, wherein the second agent is 2-deoxy-D-glucose, facentin, or AM2394.~~

~~27. The method of claim 23, further comprising:~~

~~locating a selected population of cells on a sensor device; and~~

~~displaying an electroscopic image of at least one cell from the selected population of cells.~~

~~28. The method of claim 27, wherein the electroscopic image of at least one cell is an electroscopic image from between 1 cell to about 20,000 cells.~~

~~29. The method of claim 27, wherein the electroscopic image of cell responses for the selected population of cells is an electroscopic image video.~~

~~30. The method of claim 27, further comprising displaying a graph of at least one cell response from the selected population of cells.~~

~~31. A method for cell analysis comprising:~~

~~initiating an experiment in an analysis system using a sensor device plated with cells in a nutrient assay medium;~~

~~introducing a first agent for decoupling oxidative metabolism from a metabolic profile of cell response;~~

~~sequentially introducing a second agent for decoupling glycolytic metabolism from the metabolic profile of cell response; and~~

~~determining each of a contribution of oxidative metabolism and glycolytic metabolism to the metabolic profile by comparing results derived from the sequential introduction of the first agent and the second agent.~~

~~32. The method of claim 31, wherein the first agent is oligomycin, antimycin A, rotenone, or metformin.~~

~~33. The method of claim 31, wherein the second agent is 2-deoxy-D-glucose, koningic acid, facentin, or AM2394.~~

~~34. The method of claim 31, wherein the sensor device is a ChemFET sensor device comprising an array of ChemFET sensors.~~

~~35. The method of claim 34, wherein each ChemFET sensor in the ChemFET sensor device has an input capacitance of between 1 fF to about 10 fF.~~

~~36. The method of claim 34, wherein the ChemFET sensors have a pitch of between 850 nm to 3.3 μ.~~

~~37. The method of claim 34, wherein the sensor device is a ChemFET senor device is an ISFET sensor device selective for hydrogen ion.~~