CLAIMS

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.

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

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

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

5. The sensor device of claim 1, wherein the sensor device further comprises an array of microwells capacitively coupled to the sensor array.

6. The sensor array of claim 1, further comprising a removable cover fitting over the frame.

7. The sensor device of claim 1, further including a sample divider for providing isolated areas of the sensor array for plating each of a spatially divided sample of cells.

8. The sensor device of claim 7, wherein the sensor array further comprises a biocompatible surface coating.

9. The sensor device of claim 8, 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.