

CLAIMS

What is claimed is:

1. An apparatus comprising:
a sensor with an active surface having a plurality of reaction sites, a lid, and a flow channel formed at least partially by the active surface of the sensor and the lid,
where the lid comprises an illumination source and a heater.
2. The apparatus of claim 1, wherein the sensor comprises a Complementary Metal-Oxide Semiconductor (CMOS) detection device.
3. The apparatus of claim 2, wherein the CMOS detection device comprises a plurality of detection pixels.
4. The apparatus of any of claims 1 - 3, wherein the lid further comprises a non-transparent material.
5. The apparatus of any of claims 1 - 3, wherein the lid further comprises an opaque material.
6. The apparatus of any of claims 1 - 5, wherein the lid further comprises a fluidic channel therein, where the fluidic channel is in fluidic communication with the flow channel.
7. The apparatus of any of claims 1 - 6, wherein the lid further comprises a reservoir.
8. The apparatus of claim 7, wherein the reservoir comprises a reagent.
9. The apparatus of claim 7 or 8, wherein the reservoir comprises a buffer.
10. The apparatus of any of claims 1 - 9, wherein the heater is a resistive heater.
11. The apparatus of any of claims 1 - 10, wherein the lid is on an opposite side of the flow channel from the active surface of the sensor.
12. The apparatus of any of claims 1 - 11, wherein the illumination source comprises a light emitting diode (LED).
13. The apparatus of any of claims 1 - 11, wherein the illumination source comprises a plurality of LEDs.

14. The apparatus of any of claims 1 - 12, wherein the illumination source is located along a periphery of the lid.
15. The apparatus of claim 14, wherein the lid comprises a plurality of light guides, whereby the light guides guide light from the illumination source toward the active surface of the sensor.
16. The apparatus of any of claims 1 - 15, wherein the illumination source comprises a thin film organic LED.
17. The apparatus of any of claims 1 - 16, wherein the illumination source comprises a silicon-based LED.
18. The apparatus of any of claims 1 - 17, wherein the illumination source is on a bottom surface of the lid, where the bottom surface of the lid faces the active surface of the sensor.
19. The apparatus of any of claims 1 - 18, further comprising a pump, where the pump is fluidically coupled to the flow channel.
20. The apparatus of claim 19, wherein the pump is downstream from the sensor.
21. The apparatus of claim 19, wherein the lid further comprises an outlet port, wherein the pump is adjacent to the outlet port of the lid.
22. The apparatus of any of claims 19 - 21, wherein there is no removable connection between the flow channel and the pump.
23. The apparatus of any of claims 19 - 22, wherein the pump is a piezoelectric pump having a flexible diaphragm element.
24. A method comprising:
 - fluidically coupling a first flow cell and a second flow cell to a reservoir, wherein the first flow cell and second flow cell each comprise a sensor with an active surface having a plurality of reaction sites, a lid, a heater, and a pump, where the lid and the sensor at least partially form a flow channel, where the pump is in fluidic communication with the flow channel;
 - moving fluid from the reservoir into the flow channel of the first flow cell using the pump of the first flow cell and fluid from the reservoir into the flow channel of the second flow cell using the pump of the second flow cell; and
 - heating fluid in the flow channel of the first flow cell using the heater of the first flow

cell such that fluid in the flow channel of the first flow cell is at a different temperature than the fluid in the flow channel of the second flow cell.

25. The method of claim 24, wherein moving fluid from the reservoir into the flow channel of the first flow cell does not occur while moving fluid from the reservoir into the flow channel of the second flow cell.
26. The method of any of claims 24 - 25, wherein the reservoir comprises a reagent.
27. The method of any of claims 24 - 26, wherein the reservoir comprises a buffer.
28. The method of any of claims 24 - 27, further comprising illuminating at least a portion of the reaction sites of the sensor of the first flow cell.
29. The method of any of claims 24 - 28, further comprising illuminating at least a portion of the reaction sites of the sensor of the second flow cell.
30. The method of claim 29, wherein illuminating at least a portion of the reaction sites of the sensor of the second flow cell does not occur while illuminating at least a portion of the reaction sites of the sensor of the first flow cell.
31. The method of claims 28 - 30, wherein an illumination source in the lid of the first flow cell illuminates at least a portion of the reaction sites of the sensor of the first flow cell.
32. The method of claims 29 - 31, wherein an illumination source in the lid of the second flow cell illuminates at least a portion of the reaction sites of the sensor of the second flow cell.
33. The method of any of claims 24 - 32, wherein a first sequencing run is performed on the first flow cell, and a second sequencing run is performed on the second flow cell, where the first sequencing run and second sequencing run start at different times.
34. A device comprising:
 - a sensor with an active surface having a plurality of reaction sites, a lid, and a flow channel formed at least partially by the active surface of the sensor and the lid,
 - where the lid comprises a heater.
35. The apparatus of claim 34, wherein the heater is a resistive heater.
36. The apparatus of any of claims 34 - 35, wherein the sensor comprises a Complementary Metal-Oxide Semiconductor (CMOS) detection device.

37. The apparatus of claim 36, wherein the CMOS detection device comprises a plurality of detection pixels.
38. The apparatus of any of claims 34 - 37, further comprising a pump, where the pump is fluidically coupled to the flow channel.
39. The apparatus of claim 38, wherein the pump is downstream from the sensor.
40. The apparatus of claim 38, wherein the lid further comprises an outlet port, wherein the pump is adjacent to the outlet port of the lid.
41. The apparatus of any of claims 38 - 40, wherein there is no removable connection between the flow channel and the pump.
42. The apparatus of any of claims 38 - 41, wherein the pump is a piezoelectric pump having a flexible diaphragm element.
43. An apparatus comprising:
a first sensor and a second sensor, where each of the first and second sensors comprises an active surface having a plurality of reaction sites, where the active surface comprises a plurality of embedded illumination sources,
where a flow channel is formed at least partially by the active surface of the first sensor and the active surface of the second sensor, where the active surface of the first sensor faces the active surface of the second sensor.
44. The apparatus of claim 43, wherein the embedded illumination sources are embedded into spaces between the reaction sites of the active surface of each of the first sensor and second sensor.
45. The apparatus of any of claims 43 - 44, wherein each of the embedded illumination sources is a light emitting diode (LED).
46. The apparatus of any of claims 43 - 45, further comprising a pump, where the pump is in fluidic communication with the flow channel.
47. The apparatus of claim 46, wherein the pump is downstream from the flow channel.
48. The apparatus of any of claims 46 - 47, wherein there is no removable connection between the flow channel and the pump.

49. The apparatus of any of claims 46 - 48, wherein the pump is a piezoelectric pump having a flexible diaphragm element.
50. A method comprising:
forming a first sensor and a second sensor on a flexible surface, where each of the first and second sensors comprises an active surface having a plurality of reaction sites, where the active surface comprises a plurality of embedded illumination sources; and
folding the flexible surface until the first sensor faces the second sensor, whereby a flow channel is formed between the first sensor and second sensor.
51. The method of claim 50, wherein the illumination sources are embedded into spaces between the reaction sites of the active surface of each of the first sensor and second sensor.
52. The method of any of claims 50 - 51, wherein each of the embedded illumination sources is a light emitting diode (LED).
53. The method of any of claims 50 - 52, further comprising fluidically coupling a pump to the flow channel.
54. The method of claim 53, wherein the pump is downstream from the flow channel.
55. The method of any of claims 53 - 54, wherein there is no removable connection between the flow channel and the pump.
56. The method of any of claims 53 - 55, wherein the pump is a piezoelectric pump having a flexible diaphragm element.
57. A device comprising:
a sensor, a lid, a flow channel bounded at least by the lid and a surface of the sensor, and at least one of the following: an illumination source, a heater, and a pump.