CLAIMS

1. A device, comprising:

a reaction structure that forms a plurality of reaction recesses; and

a device base positioned beneath the reaction structure, comprising:

a sensor base;

a plurality of light sensors included in the sensor base;

dielectric material layers stacked on the sensor base;

device circuitry electrically coupled to the light sensors to transmit data signals based on photons detected by the light sensors, wherein the device circuitry is provided within the dielectric material layers;

a plurality of light guides with input regions that receive excitation light and light emissions from at least one corresponding reaction recess of the reaction recesses, each light guide extending into the device base toward at least one corresponding light sensor of the light sensors, and said light guides comprising at least one filter material that filters the excitation light and permits the light emissions to pass to the at least one corresponding light sensor;

a liner layer extending over the device base and about the side surfaces of each light guide and positioned between each light guide and the device circuitry; and

a protection layer extending about each light guide, where the protection layer is chemically inert with respect to a reaction solution that passes over the reaction structure.

2. The device of claim 1, wherein the protection layer abuts the plurality of light guides within the device base.

3. The device of claim 2, further comprising a first shield layer extending between adjacent input regions to block the excitation light and light emissions incident on the first shield layer.

4. The device of claim 1, wherein the protection layer further extends between a top surface of the device base and interstitial areas of the reaction structure extending about the reaction recesses.

5. The device of claim 1, wherein the protection layer comprises silicon dioxide, a metal oxide, a metal nitride or a combination thereof.

6. The device of claim 1, wherein the protection layer comprises silicon carbide, silicon oxycarbide, silicon nitrocarbide, a metal oxide, a metal nitride or a combination thereof.

7. The device of claim 1, wherein the pH of the reaction solution is greater than or equal to about 8.

8. The device of claim 7, wherein the protection layer comprises silicon dioxide, silicon oxynitride, silicon monoxide, silicon carbide, silicon oxycarbide, silicon nitrocarbide, metal oxide, metal nitride or a combination thereof.

9. The device of claim 1, wherein the pH of the reaction solution is less than or equal to about 5.

10. The device of claim 9, wherein the protection layer comprises silicon carbide, silicon oxycarbide, silicon nitrocarbide, a metal oxide, a metal nitride or a combination thereof.

11. The device of claim 1, wherein the protection layer comprises a liquid impervious barrier layer.

12. The device of claim 1, wherein the device circuitry comprises interconnected conductive elements, and the protection layer prevents the reaction solution from oxidizing the conductive elements.

13. The device of claim 1, wherein the thickness of the protection layer is within the range of about 5 nanometers to about 100 nanometers.

14. The device of claim 1, wherein the reaction structure comprises at least one reaction site immobilized to the reaction structure within each of the reaction recesses.

15. The device of claim 14, wherein the at least one reaction site comprises at least one analyte, and wherein the reaction solution comprises at least one fluorescently-labeled molecule.

16. The device of claim 1, wherein the device circuitry of the device base forms complementary metal-oxide semiconductor (CMOS) circuits.

17. A biosensor, comprising:

the device of claim 1; and

a flow cell mounted to the device comprising the reaction solution and at least one flow channel that is in fluid communication with the plurality of reaction recesses of the reaction structure to direct the reaction solution thereto.

18. A method, comprising:

passing a reaction solution with a pH of less than or equal to about 5 or a pH greater than or equal to about 8 over a reaction structure of a biosensor, where the biosensor comprises:

the reaction structure that forms a plurality of reaction recesses; and

a device base positioned beneath the reaction structure, comprising:

a sensor base;

a plurality of light sensors included in the sensor base;

dielectric material layers stacked on the sensor base;

device circuitry electrically coupled to the light sensors to transmit data signals based on photons detected by the light sensors, wherein the device circuitry is provided within the dielectric material layers;

a plurality of light guides with input regions that receive excitation light and light emissions from at least one corresponding reaction recess of the reaction recesses, each light guide extending into the device base toward at least one corresponding light sensor of the light sensors, and said light guides comprising at least one filter material that filters the excitation light and permits the light emissions to pass to the at least one corresponding light sensor,

a liner layer extending over the device base and about the side surfaces of each light guide and positioned between each light guide and the device circuitry; and

a protection layer extending about each light guide, where the protection layer is chemically inert with respect to a reaction solution that passes over the reaction structure.

19. The method of claim 18, wherein the protection layer comprises silicon dioxide, silicon oxynitride, silicon monoxide, silicon carbide, silicon oxycarbide, silicon nitrocarbide, metal oxide, metal nitride or a combination thereof.

20. The method of claim 18, wherein the at least one reaction site comprises at least one analyte, and wherein the reaction solution comprises at least one fluorescently-labeled molecule.