An integrated semiconductor device enabling non-optical genome sequencing

What is the technology?

Ion-sensitive field effect transistor (ISFET)

ISFET devices have been studied for many years. Proposed in 1969 (Development of an Ion-Sensitive Solid-State Device for Neurophysiological Measurements). The original design consisted of a silicon substrate, a source, a drain and an oxide sensing layer. The experiment consisted of providing a 100mV drain-to-source voltage and then measuring the drain current as a potential drop across a 10 ohm resistor connected in series.

(insert schematic of the circuit along with the graph of the pH)

How does it work?

Biology Background:

When a nucleotide is incorporated into DNA there is a release of hydrogen atoms. The release of the hydrogen atoms causes a change of pH. Solid state electronics have been studied to detect and measure the value of pH in a solution. PH is a measure of acidity or basicity of a solution.

Where aH+ is the molar concentration of protons in a solution.

When the hydrogen atoms are released they interact with the OH group of the metal oxide sensing layer, the dangling bonds.

How is the current device an improvement on the old one?