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Open Configuration Optoelectrowetting Droplet Actuation

A new open wetting technology uses a photoconductor and coplanar electrodes to enable simultaneous, addressable multi-droplet manipulation for integration with various applications like PCR chips and glucose detection.

When working with very thin layers of liquid materials, the ability to manipulate the covered area is key to the applications of use for each liquid. A common approach to manipulating liquid materials is called closed wetting where a liquid is placed between two plates and an electrostatic charge is placed on the liquid thereby moving it as needed; however, this method does not lend itself to be combined with other thin layer manipulation methods. Another technique used with very limited success is called open wetting where there is only the bottom plate and the charge is delivered through the plate. This method is not as effective in moving the liquid in the desired manner, but does lend itself to be combined with other manipulation methods. Subsequently, the need for a more effective open wetting technology exists.

Researchers at Purdue University have developed an open wetting technology that works better than the standard open wetting technology, especially for addressable multi-droplet manipulations. This technology includes a photoconductor, a special layout of coplanar electrodes, and an insulator on a substrate, which allows simultaneous multi-droplet manipulation and leaves the top space for more flexible integrations. By using coplanar electrodes to form an equivalent circuit loop on the bottom substrate, an electrostatic force prompts the liquid droplet to wet the hydrophobic surface.

Advantages:

-Integrates with other methods or components

-Dynamic generation of virtual electrodes

Potential Applications:

Technology ID

65147

Category

Semiconductors/Devices & Components
Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

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Further information

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View online

-PCR chip

-Glucose detection

TRL: 4

Intellectual Property:

Provisional-Patent, 2009-06-25, United States | PCT-Patent, 2010-06-25, WO | Utility Patent, 2011-12-22, United States

Keywords: open wetting technology, multi-droplet manipulation, coplanar electrodes, liquid materials, thin layers, electrostatic force, photoconductor, insulator, PCR chip, glucose detection, Electrical Engineering, Glucose, Materials and Manufacturing, Optoelectronics, Photoconductors, Photovoltaics, Polymers