Wirelessly Powered Microfluidic Devices

Tech ID: 21900 / UC Case 2011-085-0

BACKGROUND

The last decade has seen tremendous activity in the development of lab-on-a-chip devices utilizing the interaction between suspended biological particles and an electric field. Research groups over the world have fabricated micro- and nano-scaled arrays to demonstrate many functionalities, such as detection, sorting, assembly, and monitoring of mammalian cells, microbeads, bacteria, immunoassay, proteins, DNAs, etc. Microchip-based electrophoresis technology is attractive because of its compact size, parallel architecture, and low cost, which promises higher throughput, faster results, and considerable reduction in the amount of reagents and waste. Despite the technology's great promise, its acceptance has been slow for clinical applications, such as digital pathology and point-of-care diagnosis. Perhaps the biggest barrier to such acceptance by clinicians is the technology's requirement of multiple electrical wires between test sample and electronic instruments and configuration for appropriate operation conditions. There has been little effort to remove this barrier.

TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed concepts and methods for incorporating printed integrated circuits into microfluidic devices and powering such electronic microfluidic devices wirelessly. In one example, the circuit elements (capacitors, diodes, gates, wires, and electrodes) were roll-to-roll printed on the plastic substrate containing the microfluidic structures and powering was accomplished by wireless coupling from a radio-frequency identification (RFID) reader. On-chip electrophoresis experiments, e.g., fast and effective assembly of microbead arrays and antibodies, have been performed using such a wirelessly powered device. Devices with additional functionality can be fabricated, e.g., with the integration of ring oscillators to generate AC signals for manipulation techniques based on AC-dieletrophoretic effects. Further, with incorporation of cell impedance measurement capability into the device, the data acquired can be sent back to the RFID reader via the printed antenna to realize wireless data transmission and storage.

INTELLECTUAL PROPERTY INFO

This technology has a patent pending and is available for licensing and/or sponsorship.

RELATED MATERIALS

- Wirelessly Powered Microfluidic Dielectrophoresis Devices Using Printable RF Circuits, Lab Chip, 2011, 11, 1074-1080.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,024,819	07/17/2018	2011-085
United States Of America	Issued Patent	9,484,772	11/01/2016	2011-113

CONTACT
University of California, San Diego
Office of Innovation and Commercialization
innovation@ucsd.edu
tel: 858.534.5815.

OTHER INFORMATION

KEYWORDS
wireless power, lab-on-a-chip, microfluidic, dielectrophoresis, RFID

CATEGORIZED AS
- **Communications**
  - Wireless
- **Medical**
  - Devices

RELATED CASES
2011-085-0, 2011-113-0