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Abstract

Inkjet microfluidic technology for printing and life science applications

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Abstract:

Recently, there has been a lot of interest in microfluidic lab-on-a chip applications for life sciences, forensic, point-of-care, molecular-diagnostic, other in-vitro-diagnostic, organs- on-a-chip, environmental and other applications. Various scientific and commercial organizations explore different material sets and operational principles to forge microfluidic devices. Simultaneously, the inkjet industry is repurposing its well-developed material base and manufacturing processes for large scale fabrication of complex microfluidic systems for precision dispense, droplet manipulation and other applications. The presentation describes our recent progress in the development of a low-cost microfluidic platform utilizing the materials and processes of the commercial thermal inkjet business. The well-established microfluidic components and jetting elements are being repurposed for pumping, mixing, valving, fluid transport, sensing and other critical functions of complex integrated microfluidic systems. This presentation describes the operating principles of microfluidic elements, gives examples of their integration in functional devices and discusses the potential of the inkjet technology to deliver a broad range of microfluidic applications and lab-on-a-chip diagnostic devices.

Biography:

Alexander Govyadinov has over 35 years of experience in various sensing platform development in academic and R&D industrial environments, and recent 18 years works for Hewlett-Packard printing, and after the Company split for HP Inc. in Advance Technology and Product Development Organization developing novel sensing and microfluidic solutions for inkjet and other applications. He developed Light Scattering Drop Detection concept implemented in HP first page wide array printers Office

jet ProX series. Last decade he led development of novel concepts of microfluidic architectures enabling HP advanced inks and microfluidic components and systems for life science applications. He is co-author of multiple scientific publications and over 100 US Patents and patent applications.

Recent Publications:

1. G. Whitesides, "The origins and the future of microfluidics," Nature, vol. 442, pp. 368-373, 2006.
2. "Microfluidic Technologies: Biopharmaceutical and Healthcare Applications 2013-2023," Visiongain, Pharma report, 2013.
3. J. Stasiak, S. Richards and P. Benning, "Hewlett-Packard's MEMS technology: Thermal inkjet printing," In "Microelectronics to Nanoelectronics: Materials, Devices & Manufacturability" edited by Anupama B. Kaul. CRC Press: pp. 61-78, 2012.
4. T. Hua, E.D. Torniainen, D.P. Markel and R.N.K. Browning, "Numerical simulation of droplet ejection of thermal inkjet printheads," Int J Numer Meth Fluids, vol.77, pp. 544-570, 2015
5. E.D. Torniainen, A.N. Govyadinov, D.P. Markel and P.E. Kornilovitch, "Bubble-driven inertial micropump," Phys Fluids vol. 24, 122003, 2012.

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