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Mechanically valved centrifugal microfluidic technology and the applications

The centrifugal microfluidic systems take advantages of the inherent centrifugal force as the driving force to achieve precise control of fluid instead of the traditional mechanical or electrokinetic pumping. Because this technology tries to integrate all micro-fluidic components for sample extraction/separation and measurement on a rotating compact disc (CD) and functions as an instrument, it is often referred by a nickname "Lab-on-a-CD". Because it is extremely difficult to supply power to the rotating disc for valve control, many methods have been reported to realize valving on a rotating CD. Because centrifugal force is the only power source on rotating CD, there are two major limitations in existing valving methods: the fluid sample can only be controlled to flow outward to the edge of the CD under centrifugal force; the sequential control of multiple valves is very difficult to achieve. To overcome these disadvantages, we have developed a novel actuation mechanism for microfluidic system on a Lab-on-CD platform. The actuation is a hybrid macro-micro mechanism which has dramatically simplified the design and fabrication process, and provided significantly improved performance reliability. We have adopted a hybrid approach based on micro-fabricated fluidic system and external pinch-valving technology. The sequential control of microscopic fluid samples has been achieved and extraction of red blood cells and plasma from whole blood has been achieved. A prototype lab-on-CD system has been successfully demonstrated for urinalysis. The lab-on-CD technology is proved to be *highly reliable*, significantly better than existing technologies reported in the field.

Biography

Wanjun Wang obtained his PhD from The University of Texas at Austin, Texas, USA, in 1989. He is currently full Professor in the Department of Industrial and Mechanical Engineering in Louisiana State University. He has published intensively in the field of microfluidic systems and is a fellow of SPIE and associate editor for the SPIE Journal of Micro/Nanolithography, MEMS, and MOEMS.

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