Precise detection of the size of monodisperse droplets considering the fluctuations induced by the droplet generation process

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Abstract

For droplet microfluidics, the electrical-detection method which can precisely detect the size of monodisperse droplets is demonstrated in this paper. In a Flow-focusing microdroplet generator, three pairs of the microelectrodes are allocated along the microchannel, and during the passing-by process of each droplet, both the length, the velocity and the production speed of the droplets can be obtained from the experimental measurements of the time-varying capacitance between each pair of the microelectrodes. Particularly, for different geometries of the Flow-focusing microchannel, the method of the electrical-detection is validated experimentally over a wide range of the typical conditions of monodisperse droplet production. In addition, the droplet size measured by the electrical-detection method is compared with that by the method of image processing, and the detection precision of the electrical-detection method is verified experimentally. Most importantly, by calculating the root-mean-square value of the droplet lengths for three pairs of the microelectrodes, the detection precision of the droplet size can be increased drastically.

Full Text

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