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Biography

Kazuya Tatsumi received M.E. (1999) and PhD (2003) in Kyoto University Department of Mechanical Engineering. He worked in Osaka Prefecture University as Assistant Professor in 2003-2006, and was Assistant Professor of Kyoto University in 2006-2009. He was a visiting Scholar at AGH University in 2007. He is now an Associate Professor of Department of Mechanical Engineering and Science, Kyoto University. His current interests include convective microfluidics, convective mass-transfer in blood flow, and heat and mass transfer in non-Newtonian flows.

"Timing, Spacing and Velocity Control of Particles and Cells in Microchannel Flow - A Microfluidic Pitching Machine"

Controlling the timing, interval (spacing), and velocity of the particles and cells in microchannel flows has been an important issue to develop a high-throughput system in microfluidic devices for sensing, sorting, and encapsulating. We developed a technique that can control the timing of particles crossing a certain location in the microchannel, interval between each particle, and particle velocity for particles flowing in the microchannel – making an accurate pitching machine in the microchannel – by exerting forces on the particles in periodic form over time and space. We designed the boxcar-type electrodes to produce regions of DEP force in which particles are accelerate and decelerate periodically in the streamwise direction. The DEP force was activated periodically over time, and the particles and cells converge to the equilibrium state resulting in the alignment and timing control of the particles and cells. We have conducted analysis based on the perturbation theory and three-dimensional numerical simulation to investigate the convergence of the particle motion to the equilibrium state and the motion of particles. Through the measurement of the particle motion and the probability density function of the controlling values for the particles and cells, we demonstrated the high accuracy of the present method by showing that the variation to the target value falls in the range of several percent.

References

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