

Exploring Physics of Microfluidics in Mechanical Engineering

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ABSTRACT

Microfluidic systems have attracted a great deal of attention due to their upper-hand over conventional technologies stemming from their easy fabrication, precise manipulation, cost-effectiveness, sensitivity and simplicity. Particularly, these systems have become more important in the field of chemical science, engineering disciplines and clinics, as well as LOC (Lab on Chip) and μ TAS (micro-total-analysis-systems) applications. Moreover, many microfluidic devices owe their success to fluid inertia in the fields of particle-particle separation, switching and focusing. Not only the particle's manipulation is accomplished by passive methods, but also we have tried active approaches in achieving versatile separation biological particles. The design of microchannel is also another important parameter to get very efficient particle separation via hybrid approach in inertial microfluidics. Moreover, the effect of the curvature angle - which has not been mentioned in any formula - on the particle-particle separation, is nothing more than design criteria. In addition, increase of the curvature angle is found to have positive effect on focusing quality, thus resulting in a more efficient separation. In addition to these, particle-particle interaction in multi-particle is to be revealed and confirmed by experiments. By using physics of particle manipulation, we also employ several designs of microchannel to explore sensor technology as well as to study mechanobiology of cells by microfluidics.

Keywords—microfluidics, mechanobiology, microfabrication, inertial microfluidics

BRIEF BIOGRAPHY

Levent Trabzon is a faculty member of Mechanical Engineering at Istanbul Technical University, ITU. He completed B.Sc. degree on the Mechanical Engineering Department at Bogazici University, Istanbul in 1992 and M.Sc. degree on the Materials Science and Engineering at Carnegie-Mellon University, Pittsburgh in 1995 and Ph.D. degree on Engineering Science Department at The Pennsylvania State University, State College, in 2000. He was the founder director of Nanotechnology Research and Application Center - ITU nano and he is currently director of MEMS Research Center. He has published more than 90 research articles in journals and conferences with six patents application. One of his awards was the Technology award from Elginkan Foundation for his contribution on MEMS technology. His research interests are primarily on MEMS-Design and fabrication, nano-technology/materials, microfluidics, surface science and polymer-nano-composites.