Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Selective Control of Particle Flows Through Microchannel Contractions by Using Laser-Induced Thermophoresis[1] TETSURO TSUJI, Kyoto University, SATOYUKI KAWANO, Osaka University — Absorption of a focused laser into solvents can be used to create a microscale heat source in microchannels. A temperature gradient of about 1 K/μm can be achieved due to the smallness of heat source volume, and it effectively exerts thermophoretic forces on dispersed particles to transport them along the temperature gradient The magnitude and direction of the thermophoretic force are sensitive to the physical properties of particle. Therefore, when the mixture of particles with different thermophoretic characteristics are dispersed in the solution, selective particle flows can be realized by using laser-induced thermophoresis. In this study, the demonstration of selective particle transport in a microchannel contraction will be made for the mixture of polystyrene and silica beads with equal diameters. The polystyrene beads are thermophoretically-active and repelled from high temperature regions, while the silica beads are thermophoretically-inactive. By designing the microchannel contraction so that the width is comparable to the laser spot diameter and by irradiating the laser at the contraction entrance, the thermophoretically-inactive silica beads can be transported into the contraction part using the pressure-driven flows while the thermophoretically-active polystyrene beads are moved away from the focal point in two-dimensional axial symmetry.

[1]JSPS KAKENHI Grant Number JP18H05242

Tetsuro Tsuji
Kyoto University

Date submitted: 30 Jul 2019 Electronic form version 1.4