Droplet-based microfluidic system provide promising solutions to algae-based CO2 conversion feasibility

성영준, 심상준†
고려대학교
(simsj@korea.ac.kr†)

Microalgae, unicellular photosynthetic organisms, have received great attention for biological conversion of CO_2. For the commercial use of microalgae, it is necessary to screening of strains for enhanced biomass productivity. We introduced droplet-based microfluidic system to analyze the growth performance of microalgal cells. Droplets were reinjected into storage chamber containing micropillar arrays which can capture the droplets. Transparent and porous PDMS-based microfluidics is appropriate for the supplementation of CO_2 and light which is essential for photoautotrophic culture of microalgal cells. To isolate the strains with high growth rate in droplet, we developed density-based magnetophoretic sorting system. When the magnetic field was applied to droplets in the perpendicular direction of flow, magnetic droplets could be attracted toward the magnet having different acceleration. Consequently, 90.66% of high density droplets could be isolated using stepwise expanded microchannel. These results indicate that novel approaches using droplet-based microfluidics can provide solutions to achieve economic feasibility of algae-based CO_2 conversion process.