증발 액적 내부 유동의 스케일링 관계 및 액적 표면 점착 조건의 영향

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Scaling relations for the flows inside an evaporating droplet and the effect of no-slip boundary condition on droplet surface

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Key Words: Evaporating Droplet(증발액적), Rayleigh Convection(레일리 대류), Surfactant(계면활성제), Marangoni Effect(마랑고니 효과), Scaling Relation(스케일링 관계)

Abstract : We analyzed the Rayleigh-type natural convection inside a two-component evaporating droplet numerically, and the numerical results are verified by the experimental data obtained by the PIV technique. We found experimentally that the boundary condition on the droplet surface is close to the no-slip condition, which is supposed to be due to the Marangoni effect. The effect of boundary condition on the flow and concentration distribution is discussed based on the numerical results. The dependence of the velocity magnitude on the Rayleigh number shows a fairly good agreement to the numerical predictions. It is also shown, as predicted before, that there exists a pseudo-steady condition for the velocity field.

장애물을 이용한 Y-채널 마이크로믹서의 최적설계

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Optimum Design of a Y-channel Micromixer using Obstacles

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Key Words: Micromixer(마이크로 믹서), Microchannel(마이크로 채널), Mixing Efficiency(혼합효율), Mass Concentration(질량 농도), Optimum Design(최적 설계)

Abstract : Mixing of independent fluids is of significant importance in microfluidics applications. However, efficient mixing is hampered by comparatively slow molecular diffusion process at this micro-scale. In the present study, in order to enhance the mixing efficiency, the configuration of obstacles in the Y-channel micromixer is optimized using an approximate optimization technique. Before optimization, mixing characteristics is analyzed by an unstructured grid CFD simulation. The meta model of the mixer configurations is proposed using the analysis method and neural network theory. Sequential Quadratic Programming(SQP) method is applied to the optimization procedure. Through these procedures, the parameters of configuration such as the radii and locations of obstacles are optimized.