

용해성 물질의 와도지수와 혼합지수의 관계에 대한 연구

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Numerical Studies on the Relationship between Vortex Index and Mixing Index of Soluble Solutions

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Key Words: Soluble Solution(용해성 물질), Vortex Index(와도지수), Mixing Index(혼합지수)

Abstract : Biochemical Analysis performed in a microfluidic chip often requires mixing of soluble solutions with varying properties based on the mass fraction. In order to predict the mixing behavior of soluble solutions (glycerol/water) with high Schmidt number, the relationship between Vortex Index(Ω_I) and Mixing Index(D_I) is investigated for straight, squarewave, and arbitrary shaped microchannels. As a result, a simple algebraic equation, $D_I = A \exp(B\Omega_I)$, is derived by the regression analysis. The coefficients, A and B, for the mixing of arbitrary soluble solutions are then determined by evaluating effects of Re and Pe on the relationship of Vortex and Mixing Indices. It is under further investigation whether the equation may replace the conventional mass transfer equations to estimate the degree of mixing in a microchannel.

상용 CFD code를 이용한 GeRotor 펌프 유동해석 및 포트 최적화

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Flow Analysis and Port Optimization of GeRotor Pump Using Commercial CFD Code

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Key Words: GeRotor pump(지로터 펌프), Optimization(최적화), Method of Experiment(실험계획법), Taguchi method(다구찌법), CFD(Computational Fluid Dynamics)

Abstract : GeRotor pump is widely used in the automotive industry for fuel lift, injection, engine oil lubrication, and also in transmission systems. The CFD study of the pump, which is characterized by transient flow with moving rotor boundaries, has been performed to obtain the most optimum shape of the inlet/outlet port of the pump. Various shapes of the port have been tested to investigate how they affect flow rates and fluctuations. Based on the parametric study, an optimum shape has been determined for the maximum flow rate and minimum fluctuations. The result has been confirmed by experiments. For the optimization, Taguchi method has been adapted. The groove shape has been found to be the most important factor among the selected several parameters related to flow rate and fluctuations.