압전 마이크로 밸브의 유동 특성

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Flow Characteristics of the Piezoelectric Type Microvalve

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Key Words: Piezoelectric element(압전소자), Microvalve(마이크로밸브), Flow field numerical analysis(유동장 수치해석), Pressure regulator(압력 레귤레이터)

Abstract : In this study, flow characteristics of the piezoelectric type microvalve which was manufactured for pneumatic pressure control were analyzed. Piezoelectric actuators which are applied in MEMS and NEMS have some advantages like fast response and energy saving. Meanwhile, it is difficult to get the hysteresis linearity and precise assembling because of ferroelectricity and tiny displacement. Tiny displacement affects the discharge coefficient and eddy flow directly. So, it is very important study to analyze the flow characteristics of the microvalve with piezoelectric actuator. In this study, flow field numerical analysis of the object microvalve of which displacement is 25㎛ was operated and distribution of the flow pressure and velocity was analyzed.

진동 교반기가 있는 미소채널에서 혼합에 대한 Karman와의 영향

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The Effect of Karman Vortex for Mixing in a Micro-channel with an Oscillating Micro-stirrer

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Key Words: Karman Vortex(Karman와), Active mixer(능동혼합기), Oscillating stirrer(진동교반기), Perfect Mixing(완전혼합), Lattice Boltzmann Method(격자볼츠만법)

Abstract : In order to consider the effect of Karman vortex for mixing, mixing indices are calculated for 4 models of micro channel flows driven from the combinations of a circular cylinder and a oscillating stirrer. And their results are compared to that of a simple straight micro channel flow(model I). The mixing rate is improved 5.5 times by Karman vortex (model II) and 11.0 times by the stirrer(model III) respectively. In case successive mixing by the cylinder and the stirrer(model IV), 27% shortening the channel length for complete the mixing as well as 1.37 times improvement of mixing efficiency than model III. And then, variation of mixing indices are much stable compare to the others. Thus, it is found that the Karman vortex plays a good role as a pre-mixing method. The D2Q9 Lattice Boltzmann methods are used.