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Effect of Korteweg Stress of Miscible Two Liquid Flow on Micro Fluidic Devices YASUHIKO SUGII, KOJI OKAMOTO, AKIHIDE HIBARA, University of Tokyo, MANABU TOKESHI, KAST, TAKEHIKO KITAMORI, University of Tokyo, 1DEPT.OF QUANTUM ENGINEERING AND SYSTEMS SCIENCE, UNIVERSITY OF TOKYO TEAM, 2DEPT. OF APPLIED CHEMISTRY, UNIVERSITY OF TOKYO TEAM, INTEGRATED CHEMISTRY PROJECT, KANAGAWA ACADEMY OF SCIENCE AND TECHNOLOGY TEAM — In order to design the micro fluidic devices, it is important to investigate the dynamics such as mixing, molecular transformation and interfacial instability in both of miscible and immiscible multi-layer flow. In this study, miscible liquid two-layer flow, water and ethanol, in a Y-shaped microfluidic device, which consists of microchannels with 120 micro m in width and 35 micro m in depth, is experimentally investigated by particle image velocimetry (PIV) to clarify the flow characteristics. The obtained velocity distributions with a spatial resolution of 5.9 x 1.5 micro mˆ2 around the miscible interface between water and ethanol varying flow rate and concentration of ethanol, indicate an imbalance in shear stress at interface. The difference of shear stress was compared with the Korteweg stress, which was generated by interfacial tension gradient due to a concentration gradient by diffusion in a miscible two-layer flow. The results indicate that the stress was balanced with the shear stress around the interface.

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