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Formation of parallel two-phase flow in nanochannel and application to solvent extraction[1] YUTAKA KAZOE, TAKUYA UGAJIN, RYOICHI OHTA, KAZUMA MAWATARI, TAKEHIKO KITAMORI, The University of Tokyo, THE UNIVERSITY OF TOKYO TEAM — Micro chemical systems have realized high-throughput analysis in ultra small volumes. Our group has established unit operations such as extraction, separation and reaction, and a concept of integration of chemical processes using parallel multi-phase flows in microchannels. Recently, the research field has been extended to 10-1000 nm space (extended-nanospace). Exploiting extended-nanospace, we developed ultra high performance chemical operations such as aL-chromatography and single molecule immunoassay. However, formation of parallel multi-phase flow in nanochannels has been difficult. The challenge is to control liquid-liquid/gas-liquid interfaces in 100 nm-scale. For this purpose, this study developed a partial surface modification method of nanochannel and verified formation of parallel two-phase flow. We achieved partial hydrophobic modification using focused ion beam (FIB). Using this method, formation of parallel water/dodecane two-phase flow in a nanochannel of 1500 nm width and 890 nm depth was succeeded. Solvent extraction of lipid, which is a basic separation in bioanalysis, was achieved in 25 fL volume much smaller than single cell. This study will greatly contribute to develop novel nanofluidic devices for chemical analysis and chemical synthesis.

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