

Low power EWOD(electrowetting on dielectric) chip for lab-on-a-chip system application

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The miniaturization technology such as micro total analysis systems (μ -TAS) and lab-on-a-chip has been paid big attention for biomedical application. In micro systems the surface tension is dominant because of high surface-to-volume ratio. Electrowetting phenomenon has been applied to manipulate discrete micro-droplet for lab-on-a-chip systems by modulating the surface tension with electrical signals. It does not need complex micro-channel and additional elements such as valves or pumps.

In this study, we present EWOD (Electrowetting on dielectric) microfluidic chip aiming to lower the power for IT compatibility. This chip was designed by conventional semiconductor processes. 500-700Å Al_2O_3 was deposited by ALD(Atomic layer deposition) as a high-k dielectric on patterned electrodes. Teflon AF spin-coating, PECVD fluorocarbon and DDMS SAM were collated as hydrophobic coating material. Surfactant effect with various concentrations of Pluronic F-127 was surveyed to decrease surface tension of D.I. water droplet. 700-950 nl of droplet dispensed between ITO coated glass and Si wafer substrate with 200-300 μm gap was actuated by applying 20V.