Capillary-driven Flow behaviors in Micro/Nanofluidics fabricated by Hydrophilic Polymer for Aqueous System

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We developed novel hydrophilic hybrid polymer (HP) with excellent processibility and UV/thermal curability, which reveled low contact angle range at 13~23°, depending on the chemical composition. This low contact angle with water can make capillary-driven spontaneous flow without additional syringe pump through microchannel. Moreover, it is advantageous that the cured HP exhibited resistance to several organic solvents and UV/visible transparency and high replication fidelity. In the case of PDMS, spontaneous flow was not occurred with presence of convex meniscus, which is due to the hydrophobic non-wetting surfaceof the PDMS channel. On the contrary, the channel fabricated by HP-PDMS hybrid showed concave meniscus and spontaneous flow phenomenon by capillary force. It interprets that the adhesion force between water and the hydrophilic surface is stronger than the cohesion force between water molecules. The capillary-driven spontaneous flow in hydrophilic microchannel can be controlled by change of dimension of channel.