

Gradual modification of Nanoimprint Patterns by Oxygen Plasma Treatment

Soo Hyun Kim¹, Da Sol Kim¹, Dae Keun Park¹, Kun-Hee Yun¹, Mira Jeong², Jae Jong Lee², and Wan Soo Yun^{1*}

¹Department of Chemistry, Sungkyunkwan University (SKKU), Suwon 440-746, South Korea

²Nano Convergence and Manufacturing Systems Research Division, Korea Institute of Machinery & Materials (KIMM), Daejeon 305-343, South Korea

We report on a simple method for inducing physical and chemical property-gradient on nanoimprinted patterns by intensity-regulated plasma treatment under caved sample stage. As for the size gradient, a line pattern having a linewidth of 294.9 nm was etched to have gradually varying width from 277.4 nm to 147.9 nm. Modified pattern was proven to be adaptable to replica stamp for reversal patterning. To investigate the wettability gradient, imprinted nanopatterns were coated with fluoroalkylsilane to increase the hydrophobicity, and the surface was modified to have gradually varying wettability from hydrophobic to hydrophilic (contact angle was $\sim 160^\circ$ to $\sim 5^\circ$ on a single chip). This method is expected to be applicable to the selective adsorption of biological entities and hydrodynamic manipulation of liquid droplets for the pumpless microfluidics.

Keywords: Nanoimprint, plasma, property-gradient