

Effect of the Surface Free Energy of Polymer Substrate on Fabricating Surface Microsystems through LBL Coating

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The surface free energy of three polymeric substrates, PMMA (Poly (methylmetacrylate)), PS (Poly(styrene)) and PC (Poly(carbonate)), subjected to RF O₂ plasma treatment and washing with water was studied with for the purpose of fabricating surface micro-systems by the LBL technique. More uniform hysteresis of the DI water contact angle after plasma treatment followed by washing with water was observed on the PS surface than on the PMMA and PC surfaces. The XPS result revealed that washing with water may change the plasma generated functionalities, which readily form on oxygen containing groups such as C=O and O-C=O. The surface free energy measured by the acid-base method revealed that the Lewis base components on PS were less affected than those on PMMA and PC, due to the weak solvent effect of the former. During the LBL coating of the polyelectrolyte, the solvent effect was less likely to occur on PS, which exhibited better electrostatic bonding of the positive and negative polyelectrolytes (PEL). Fluorescence Intensity was almost identical to the above findings, which may contribute to choosing the best substrate for surface micro-patterning by the LBL technique.