The Fabrication of Three-Dimensional Cross Bar Circuits by Nanoimprint Lithography

Romulo Magallanes, Hee Kun Park and Yong Chen
Department of Mechanical Engineering
UCLA

Nanoimprint lithography (NIL) is a direct contact-method for transferring a pattern to a substrate to fabricate a mold. NIL involves the physical deformation of a resist layer on the substrate by a mold followed by curing the sample with ultraviolet irradiation. The mold is detached from the substrate and leaves a reverse pattern on the resist layer. In this proposal, we plan to develop a nanotransport printing process that can fabricate three-dimensional crossbar circuits by applying two layers of conductive polymers on a substrate and pressing to it the mold fabricated by NIL to transfer the pattern structures. Numerous layers of patterns can be transferred to the same substrate but must rotated ninety degrees every time before adding a new layer of patterns. We face the challenges of high defect count in the pattern structure and overlay in the substrate due to the continuous addition of layers of patterns on the substrate. We are working in reducing high defect count by applying the surfactant perfluorooctyl trichlorosilane, FOTS, coating on the surface of the mold and prevent the layers of conductive polymers from adhering to the mold during the detachment process. We have been able to apply four layers of patterns successfully without overlay that is the substrate did not bend with the high density of the cross bar structures. Defects are inevitable when fabricating three-dimensional cross bar circuits using the method of nanoimprint lithography; however, in this proposal we will only be focusing on the pattern structures.