Nanotek-2013

OMICS Group Conferences
Accelerating Scientific Discovery

3rd International Conference on
Nanotek & Expo

December 2-4, 2013 Las Vegas, USA

Reversible nano-lithography between materials

Jae Hong Park

Korea National NanoFab Center, Korea

Abstract

One of the two main processes of engineering nanostructures is the top down method, which is a direct engineering method for Si-type materials using photolithography or e-beam lithography. The other method is the bottom-up method, using nano-imprinting. However, these methods are very dependent on the equipment used, and have a high process cost. They are also relatively inefficient methods in terms of processing time and energy. Therefore, some researchers have studied the replication of nano-scale patterns via the soft lithographic concept, which is more efficient and requires a lower processing cost. In this study, accurate nanostructures with various aspect ratios are created on several types of materials. A silicon (Si) nanomold is preserved using the method described, and target nanostructures are replicated reversibly and unlimitedly to or from various hard and soft materials. The optimum method of transferring nanostructures on polymeric materials to metallic materials using electroplating technology was also described. Optimal replication and demolding processes for nanostructures with high aspect ratios, which proved the most difficult, were suggested by controlling the surface energy between the functional materials. Relevant numerical studies and analysis were also performed. Our results showed that it was possible to realize accurate nanostructures with high depth aspect ratios of up to 1:18 on lines with widths from 300–400 nm.

In addition, we were able to expand the applicability of the nano structured mold by adopting various backing materials, including a rounded substrate. The application scope was extended further by transferring the nanostructures between different species of materials, including metallic materials as well as an identical species of material. In particular, the methodology suggested in this research provides the great possibility of creating nanostructures composed of various materials, such as soft polymer, hard polymer, and metal, as well as Si. Such nanostructures are required for a vast range of optical and display devices, photonic components, physical devices, energy devices including electrodes of secondary batteries, fuel cells, solar cells, and energy harvesters, biological devices including biochips, biomimetic or biosimilar structured devices, and mechanical devices including micro- or nano-scale sensors and actuators.

Biography

Jae Hong Park has completed his Ph.D at the age of 33 years from Seoul National University and postdoctoral studies from Korea Institute of Science and Technology and Harvard Medical School, respectively. He is a senior researcher of National NanoFab Center in Korea. He has published more than 30 papers in reputed SCI journals and serving as an editorial board member of repute.