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Nanofabrication by Nanoimprint and Electron Beam Lithography and Applications

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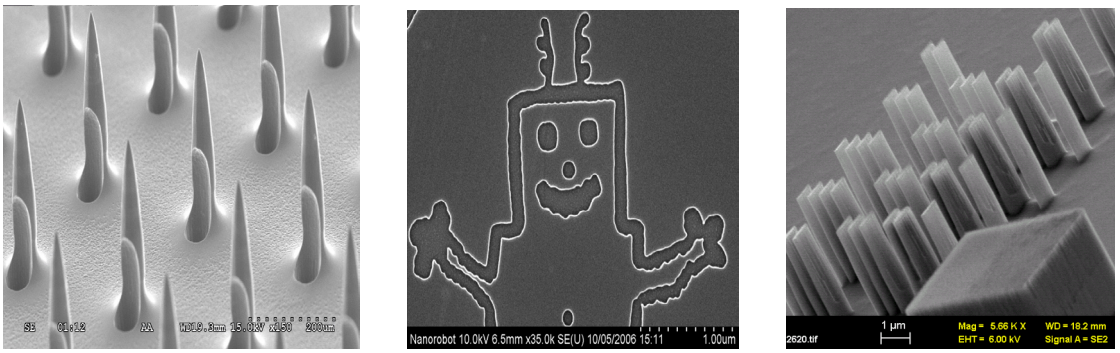
E-beam lithography (EBL) and nanoimprint lithography (NIL) are two most popular nanolithography techniques. EBL is based on material (called resist) property modification by its exposure to focused electron beam; whereas NIL relies on the mechanical conformation of a low viscosity resist to the structures of a mold. In the talk, I will first present EBL resist with a focus of polystyrene that can achieve ultra-high sensitivity or ultra-high resolution; and more importantly, it can be evaporated in order to pattern any non-flat or irregular surface such as an AFM cantilever or an optical fiber. I will also present our study using grafted mono-layer brush as e-beam resist for nanofabrication on irregular surfaces. I will then present our work on NIL using hard/soft bi-layer mold that have great advantages over conventional silicon mold.

Next, I will cover a few applications of nanostructures fabricated by NIL and EBL, notably metallic nanostructures for plasmonic applications. Lastly I will present the fabrication of high resolution probe for atomic force microscope (AFM), and hollow micro-needle arrays for point-of-care diagnostic applications.



(left) High aspect ratio (1:30) structures fabricated by EBL and RIE. (middle) Nano-robot by EBL. (right) Hollow micro-needle array for drug delivery and point-of-care diagnostic applications.

Biography:

Dr. Bo Cui (崔波) received his BS in physics from Peking University (China) in 1994. After two years of graduate study in the same department, he moved to the University of Minnesota, then to Princeton University in 1998, where he earned his Master's degree in 2000 and PhD in 2003 from the Nanostructure Laboratory, Department of Electrical Engineering.

After completing his PhD, he joined the National Research Council of Canada in 2003 as a staff scientist. In 2008 Dr. Bo Cui joined the Department of Electrical and Computer Engineering, University of Waterloo (Canada) as an Assistant Professor, and he was promoted to tenured associate professor in 2015. He currently leads the Waterloo Nanofabrication Group with 11 graduate students and three postdocs. His research focuses on the development of nanofabrication technologies and applications.

He is the recipient of the Dobbin Scholarship in 2011. He is the author for 100 journal publications, five patents, three book chapters, and he also edited one book titled "Recent advances in nanofabrication techniques and applications". He won the Engineering Research Excellence Award in 2014. He is the Associate Editor for Nanoscale Research Letters.