Biomolecular Architectures and Systems for Nanoscience Engineering

Jennifer N. Cha, Department of Nanoengineering and Materials Science, University of CA, San Diego

Despite the great potential of nanomaterials in electronic and photonic applications, their incorporation into functional devices will require the combination of top-down lithographic large-area patterning with the high resolution and chemical precision afforded by bottom-up self-assembly. Despite the wealth of existing lithography techniques, there remain significant hurdles to addressing below the 20nm regime. In light of these challenges, there have been significant efforts to use “bottom-up” or self-assembly approaches for patterning. One key, “manufacturable” approach has been to merge self-assembling systems with substrates patterned using conventional lithographic techniques. This talk will show our recent efforts in directing the placement of single stranded DNA and DNA templates on several different substrates that have been patterned by lithography. A variety of substrates have been generated by optical and e-beam lithography and these have been used to produce highly parallel arrays of mesoscale DNA scaffolds and DNA oligonucleotides in a single step. Furthermore, these DNA templates encode multiple nanometer recognition sites that can be further used to generate hierarchical assemblies of both organic and inorganic nanoscale materials. Because a significant challenge of future nanotechnology is the ability to address sub-20nm features, these self-assembled DNA arrays are being explored as potential templates for the assembly and wiring of nanoscale materials for both logic and memory.