

## Complex sculpturing 3D DNA nanostructures on protein repelling matrix using electron beam chemical nanolithography

M Nuruzzaman Khan and M. Zharnikov  
University of Heidelberg, Germany

As a holder of genetic information and due to its unique hybridization properties, deoxyribonucleic acid (DNA) represents a key object in modern science and related technology. Here we present a universal two-step procedure to fabricate mixed ssDNA/OEG-AT monolayers and 3D patterns on gold substrates with a greater precision and accuracy using Irradiation Promoted Exchange Reaction and E-Beam lithography. The orientation and ordering of DNA in the one-component A25SH monolayer and mixed ssDNA/OEG-AT monolayers was investigated by near-edge X-ray absorption fine structure (NEXAFS) spectroscopy, which proved a significant control of upright orientation of the DNA strands in both systems. The versatility of this approach is demonstrated by its combination with TdT-catalyzed SIEP that allows amplification of ssDNA/OEG-AT patterns in the z-direction. This combination provides a new method to sculpt complex 3D DNA nanostructures on solid supports. Then DNA system was successfully applied for hybridization with the complementary DNA segment and check for its broad range of activity. SAMs, homogeneous poly (A) brushes, and poly (A) nanostructures were characterized by laboratory and synchrotron-based PE spectroscopy, ellipsometry, atomic force microscopy (AFM), and optical microscopy. This system can be widely used as versatile functional moiety and nanoscale building block in such important fields as bio-engineering, bio-sensing, bio-nanotechnology, gene therapy, drug delivery, nanomedicine, and molecular biology.

### Biography

M. Nuruzzaman Khan is working as a Ph.D. researcher at the Department of Applied Physical Chemistry, University of Heidelberg under DAAD post graduate fellowship. He was a Research Assistant at the Institute of Radiation and Polymer Technology, Bangladesh Atomic Energy Commission, Bangladesh from 2008 to 2010. He has completed his M.Sc. degree from University of Dhaka, Bangladesh. His research interests are fabrication of ssDNA array, complex 3D-nanopatterning, lithography and synthesis of stimuli responsive polymer. He has published more than 7 papers in international peer reviewed journals including one in *Angewandte Chemie* Int. Ed and serving as a reviewer in reputed journals.

mnzaman.khan@uni-heidelberg.de