Bubbles and drops in nanocups and other funs of nanoengineering

Dr. Ramūnas Valiokas

Department of Nanoengineering, Center for Physical Sciences and Technology,

Lithuania

Abstract

One can draw certain analogies between the development of organic chemistry and the present expansion of nanotechnologies. Likewise in the case of the ever-growing libraries of organic compounds, thousands of new unique or modified nanostructures are being “synthesized” each year, a development that also leads toward establishment of huge databases of various nanoscale 2D and 3D morphologies. Our own contribution to this vivid field of science and technology will be briefly outlined in this lecture. Our research has been centered on development of new alternative nanofabrication techniques, as well as on new applications of the tools and structures, especially in life sciences. We have been mainly interested in directed self-assembly (DSA), a platform that merges top-down and bottom-up approaches. For example, the principles of self-assembly observed in the cell membrane can be efficiently employed in purely technical systems such as scanning probe nanolithography and, importantly, they can boost the nanofabrication process making it a much more realistic alternative (or complementary) to the commodity tools such as photo- or e-beam lithography. Also, we have merged the DSA with other fabrication tools such as inkjet printing or colloidal coatings. Unexpectedly, functional sub-100 nm features can be fabricated with high throughput already by using simple desk-top instrumentation such as automatized XY stages, nozzles, capillaries. Applications of such features in the fields of plasmonic and electrochemical nanosensors, protein patterning, cell adhesion and tissue engineering will be discussed.