Multifunctional Interfaces: From Antibody Detection on Gold to DNA Origami Assembly on SiO_2

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The ability to control, modify, and manipulate surfaces at the molecular level continues to usher in new possibilities and breakthroughs in science. These include advancements in biosensing, nanofabrication, surface patterning, and molecular electronics. Self-assembled monolayers (SAMs) have become a significant tool for customizing surface properties through molecular engineering. SAMs possess remarkable features, including precise control over surfaces, wettability, and charge distribution. These qualities make SAMs an excellent platform for exploring interfacial phenomena in both fundamental and applied research. Using SAMs as a platform, a rapid electrochemical biosensor for SARS-CoV-2 IgG antibody detection was developed. Current methods such as enzyme-linked immunosorbent assays and DNA-based assays have been used previously. However, their applications are limited. The use of these techniques requires a high level of expertise. The generation of results takes about 2 to 5 days. They also lack portability. In this presentation, I will cover the use of N-heterocyclic SAMs as an alternative to thiol-based SAMs for rapid, easy and portable electrochemical biosensing platform development. In the second part of my presentation, I will discuss an attempt made to assemble DNA origami lattices at SiO_2 surfaces at room temperature by controlling the surface potential. DNA origami nanostructures can be used as lithography masks in semiconductor processing. One way to achieve this is the hierarchical self-assembly of DNA origami nanostructures into regular 2D lattices. Hence, the precise arrangement of DNA origami nanostructures on the substrate surface is essential. DNA origami adsorption and lattice assembly were investigated *in situ* in selected electrolytes by atomic force microscopy (AFM) at different potentials. This approach allows the transfer of such templates into functional circuits or lattices using established lithographic methods.

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