GOLD NANOPARTICLE (AuNP) STRUCTURED SURFACE

Nanostructure for control of biology:
Gold sensor surfaces for z-LAB systems can be modified with a very well-defined nanostructure that makes it possible to better control and follow a sequential biological response to the surface. The impedance signal is tuned to the nanoparticles, and reactions taking place on the AuNP surfaces can be measured independently of surrounding surfaces.

Controlling the surface environment is often a key feature when studying protein adsorption. The possibility to monitor the build-up of the surface chemistry in real-time ensures a quality control of the surface. The amount of proteins adsorbed to the surface could be correlated with the amount of AuNP particles adhered down to the level of adsorbed proteins per particle.

AuNP coverage is governed by the ionic strength of the adsorption buffer. The increase in surface capacitance is proportional to the number of adsorbed particles. In Fig. 1 the real-time adsorption of AuNP to sensor surfaces is illustrated and in Fig.2 the AuNP coverage is shown from SEM analysis.
In Fig.3 the sequential modification of the surface is shown. Polyethylene glycol (PEG) is used to block space between particles and mercaptopropionic acid (MPA) is added to charge the AuNP surface in order to optimise protein adsorption.

Surface build-up and protein adsorption:

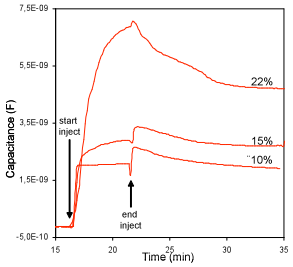

Fig. 1 Change in surface impedance depending on concentration of AuNP measured with z-LAB system.

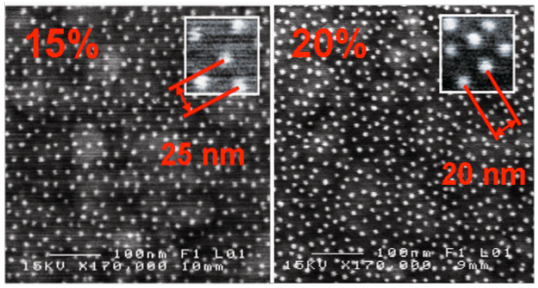

Fig. 2 SEM images of nanostructured surfaces with 15 and 20 % AuNP coverage, respectively.

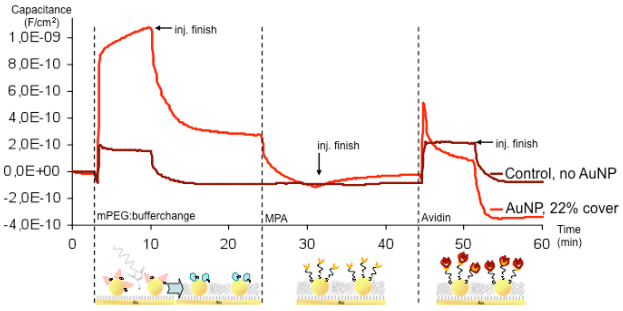

Fig. 3 The nanostructured sensor surface is modified and the adsorption of avidin is monitored using the z-LAB system.

Conclusion

The z-LAB system can be used to monitor in real-time the build-up of a well defined and ordered nanostructured surface with AuNP, which in turn can be modified to optimise protein adsorption. Increase in surface capacitance is proportional to the number of adsorbed AuNP. The measurement signal is tuned by the nanoparticles and reactions taking place on the AuNP surface can be measured independently of surrounding surfaces. The resolution is high enough to correlate the number of adsorbed proteins per nanoparticle.

Reference: Lundgren *et al.* Nanoletters, 8 (11), 2008, 3989-3992