Probing Molecular Interactions towards Biological Analysis on Surfaces

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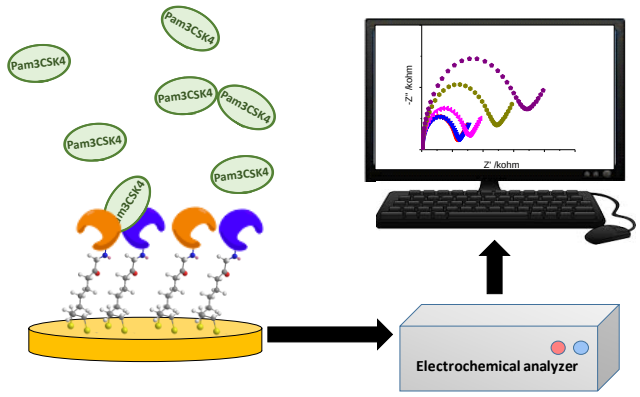

A self-assembled monolayer (SAM) is a layer of organic molecules formed at surfaces, and is often stabilized by high-binding affinities between the molecules and the surface substrate, as well as by the van der Waals interactions between the adjacent molecules. The functionality of these films is dictated by the molecular architecture and surface conditions, which can be tailored towards applications in nanofabrication and biosensors. Combination of SAMs and biological molecules such as proteins and DNAs on surfaces offers opportunities to develop sensors targeting a range of (bio-)analytes. In this talk, the focus will be on a class of proteins called Toll-Like Receptors (TLRs), which are part of the innate immune system. TLR-modified surfaces have been investigated using electrochemical techniques, such as voltammetric techniques, electrochemical impedance spectroscopy and quartz crystal microbalance. These surfaces have been shown to be effective sensors in the detection of the relevant pathogen associated molecular patterns. TLR sensors represent a new class of broad spectrum approach, which is selective and non-specific, towards pathogens detection, including bacterial and viral species. These TLR proteins are best utilized as a group of components in a sensing platform. We have carried out a proof-of-concept study for multiplex detection to demonstrate such capability. The platform itself can be used with many other biological elements beyond TLR proteins. These sensors have great potential to be applied to environmental monitoring, clinical diagnostics and biological hazard controls.

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(2) She, Z.; Kraatz, H.-B. *et al.*, *Anal. Chem.*, **2015**, *87*, 4218.
(3) She, Z.; Kraatz, H.-B. *et al.*, *Anal. Chem.*, **2017**, 89, 4882.