Designing a high performance, stable spectroscopic biosensor for the binding of large and small molecules

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In the context of spectroscopic FTIR ATR sensors, the organic layer covering the ATR element has to be as stable as possible for optimal biodetection measurements. Previously, this self-assembled covering was considered stable after several hours under a PBS flux, probably due to a hydrophobic barrier, which prevents water penetration into the grafted network. Stability and reactivity, measured simultaneously using FTIR ATR, identify the limits of the previously used molecular construction. For the first time, surface etching of the previous functionalized Ge devices (Ge-PEG-NHS), a few minutes after BSA injection, was observed. It was concluded that the molecular chain deformation of Ge-PEG-NHS likely occurred when large molecules were bound. BSA loaded onto a Ge-PEG-NHS surface led to network deprotection, with the probable disruption of hydrogen bonds for single barrier-based networks. This, in turn, was presumably influenced by the random deposition of the NHS moiety on the PEG chain. A new functionalized germanium device, using a rapid three-step in situ procedure, provides an efficient robust network composed of two protective barriers, ideal for the binding of various sized molecules. The Ge-APS-PEG-NHS device has shown exceptional sensitivity with regards to BSA and ethanolamine target molecules while offering homogeneous NHS distribution. More examples will be considered in the presentation.