

Assay based binding experiments benefit from the ability to have an inert background to improve signal to noise by reducing nonspecific adsorption. To this end we have developed a polymer (poly acrylic co -N- hydroxysuccinimide) that is highly resistant to protein adsorption and also can be modified through the utility of a NHS ester that is part of the polymer. The ability to modify the polymer through the NHS active ester allows us to add functionality to the polymer for both immobilization and sensing applications.

By using specific chemical cues on the surface, SPR can be used to detect the binding of a biomolecule to the surface of our sensor in real time. At full monolayer coverage the PAN polymer will effectively resist non-specific adsorption. We can utilize the chemistry that has been demonstrated with the use of alkanethiol SAMs to immobilize our polymer onto the gold SPR surface. We can use the linker 3-methylthiopropylamine to add the thiol functionality to the polymer in order to immobilize it to the surface. The NHS active ester coupling that we use will allow us to expand the utility of the PAN polymer to other systems such as antibody-antigen binding, DNA hybridization, and of course the ubiquitous biotin-avidin system.

Another collaborative project that I am working on is one that ties materials chemistry and analytical neurochemistry together by using fabricated microfluidic structures for studying the temporal and spatial release of a nerve cell that is confined in a microfluidic channel. The microfluidic devices that are used are fabricated by standard soft lithography techniques using PDMS. By using a C18 modified surface to act as a reversed phase material we are able to capture release from a single neuron inside of a microfluidic device. The C18 modified surface can then be analyzed offline by MALDI to detect the captured biomolecules. We are also working to integrate a planar patch clamp into this device design so that we can study the electrophysiological aspects of stimulation inside of microfluidic devices.