Nanoplasmonic sensing of natural products, COVID-19 and neurochemistry

This presentation will introduce our research activities in plasmonic nanobiosensing. Our research lies in the areas of plasmonic materials, low-fouling surface chemistry and instrumental design for biosensing. This presentation will focus on applying these concepts for several classes of sensors, such as for monitoring off flavors in maple syrups, to detect antibody quality for COVID-19 and our recent development of sensors for in tissue measurement of neurotransmitters. In the first example, AuNP were optimized to aggregate in presence of maple sap or syrup presenting off flavors. The sensor was tested with more than 1,800 maple syrups in the lab and at the maple sugar shacks by producers. In a second embodiment of our research, we developed a series of tests to monitor the presence of antibodies elicited by individuals that were infected or vaccinated for COVID-19. In this case, we use a portable SPR platform to screen for the presence of antibodies in sera of individuals and we measured the quality of their immune response with affinity and pseudo-neutralization tests. We will show data of the immune response to the original strain and for a series of variants of concerns present in Canada and elsewhere. Lastly, we are currently exploring the concept of optophysiology using plasmonic nanopipettes for monitoring living cell secretion events. Due to the lack of analytical techniques for detecting metabolites near living cells, developing tools to monitor cell secretion events remains a challenge to overcome in chemical analysis. Plasmonic nanopipettes were developed based on the decoration of patch clamp nanocapillaries with Au nanoparticles. The plasmonic nanopipette is thus competent for dynamic SERS measurements in the liquid environment near cells. This nanobiosensor was tested with the detection of small metabolites near living cells and of neurotransmitters released by neurons.