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Experimental and theoretical approach towards an SPR biosensor based on guided-wave plasmon polariton modes SARAH CLARK, MACKENZIE JEWELL, VALERIE BEALE, BRAD JOHNSON, JANELLE LEGER, Western Washington University — Surface Plasmon Resonance (SPR) is the phenomenon in which an incident electromagnetic wave couples to charge density oscillations on a metal. The resulting excitation, known as a surface plasmon polariton (SPP), will propagate along the metal-dielectric interface to which it is confined. In an SPR biosensor, a protein binding interaction at the metal surface leads to a modification of the refractive index, altering the SPP excitation conditions. Recently, we have designed a structure that supports guided-wave plasmon polariton modes (GW-PPMs), plasmonic excitations that demonstrate increased propagation lengths compared to those of traditional SPPs in certain regions of phase space. Because it has been shown that higher propagation lengths can lead to increased sensitivity in SPR biosensors, employing GW-PPM-supporting structures could potentially lead to advances in the state-of-the-art performance. In order to correlate biosensor performance with propagation lengths, however, a detailed and complete theoretical model needs to be developed that considers the specific experimental conditions utilized for SPR biosensor testing. We will discuss experimental and theoretical progress towards the production of high-performance SPR biosensors based on GW-PPMs.

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