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Comparison of sensitivities of two label-free optical detection techniques: SPR vs. oblique-incidence reflectivity difference (OI-RD) X.

D. ZHU, J. P. LANDRY, Department of Physics, University of California at Davis — Surface plasmon resonance (SPR) and recently developed oblique-incidence optical reflectivity difference or OI-RD (a special form of nulling ellipsometry) are two label-free techniques for detecting biochemical reactions and other surface processes on a solid support. In SPR, one measures the change in surface plasmon resonance angle, $\Delta\theta_{SP}$, as a result of changes in thickness and dielectric response of a molecular adlayer on the solid support coated with gold. In OI-RD, one measures the difference in fractional reflectivity change between p-polarized and s-polarized light defined as $(r_p - r_{p0})/r_{p0} - (r_s - r_{s0})/r_{s0} \equiv \Delta_p - \Delta_s$, again in response to changes in thickness and dielectric response of a molecular adlayer on the solid support. I show that the two techniques measure the same physical quantities of the molecular adlayer, up to a constant that depends on the incidence angle in OI-RD. And since $\Delta_p - \Delta_s$ is enhanced near the Brewster angle, the OI-RD technique is at least as sensitive as and more versatile than the SPR technique for label-free detection of biochemical reactions and other processes on solid surfaces.

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