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Plasmon Spectroscopy Applied to Biomolecular Interactions in Membranes[1]

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Plasmon-waveguide resonance (PWR) is an optical spectroscopy method that can provide information about materials immobilized on the surface of a plasmon resonator consisting of a right angle prism coated with thin layers of a metal (approx. 50 nm; usually silver) and a dielectric (approx. 500 nm; usually silica). The technique has been developed in our laboratory and is an extension of the more commonly used surface plasmon resonance (SPR) method, having higher sensitivity (20-50 fold) and resolution (10-20 fold). The dielectric layer allows plasmon excitation by light whose electric vector is polarized both perpendicular and parallel to the sensor surface, in contrast to SPR that can only utilize perpendicular polarized excitation. This allows both mass density and mass distribution to be characterized in uniaxially oriented deposited materials, such as biomembranes. We have utilized this technique to investigate binding interactions between membrane-incorporated protein receptors and their ligands (both proteins and small molecules), using both purified receptors inserted into lipid bilayers and membranes derived from cells expressing these receptors. Such studies have provided many new insights into biological signaling events. Inasmuch as many of these receptors are targets for approximately 50 percent of ethical drugs, PWR can be a useful methodology for drug discovery in the pharmaceutical industry. Examples of these experiments will be presented.

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