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Label-free Multimetric Measurement of Molecular Binding Kinetics

Molecular interactions play an important role in cellular functions and biotechnology including cell signaling, enzymatic reactions, early disease diagnoses, and drug screening. Label-free techniques serve as important tools for studying these processes due to their ability to provide real-time information on binding kinetics without affecting the structure and function of the sample molecules. However, most of these techniques rely on measuring refractive index or mass change on the sensor surface. Thus, small molecules or enzymatic processes that only induce minor mass change on the analyte are difficult to measure. It is these small molecule interactions, though, which are often extremely important, particularly for drug discovery.

Researchers at the Biodesign Institute of Arizona State University have developed a novel technique combining surface plasmon resonance sensing with an oscillating biomolecule layer approach (SPR-OBL) to enhance the sensitivity of traditional SPR. The OBL is a protein monolayer which is connected to the gold film surface, and when a ligand binds to it, the mass and/or charge of the OBL is changed, altering the surface refractive index and/or the oscillation amplitude or phase. This label-free technique measures molecular interactions of large biomolecules, small molecules and ions and will be useful in both research and biotechnology applications.

This multimetric SPR-OBL measurement technique is able to sense interactions/reactions involving mass or charge change (or both) as well as conformation, greatly expanding the detection capability of SPR.

Potential Applications

- Measurement of molecular binding kinetics of large biomolecules, small molecules and ions
 - Diagnostics
 - Drug screening
 - Research – enzymatic catalytic reactions, phosphorylation kinetics, cell signaling, protein-ion interactions

Benefits and Advantages

- Sensitive - can sense any changes regarding mass, charge and conformational change of the analyte, expanding the detection capability of SPR
 - Overcomes the mass limit and is able to detect small molecules, protein conformation changes and enzymatic reactions
- Does not require high resolution SPR microscope; can be used on commercial SPR systems
- Can measure multiple steps of an enzyme catalytic reaction in real-time and extract several kinetic parameters in a single measurement
- Label-free

For more information about this opportunity, please see

[Zhou et al - ACS Sens. - 2022](#)

For more information about the inventor(s) and their research, please see

[Dr. Wang's departmental webpage](#)

[Dr. Wang's laboratory webpage](#)