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PHOTOACTIVE NANOSTRUCTURE FOR HIGH SENSITIVE BIOSENSOR PLATFORM MINIATURIZATION FOR BIOMEDICAL APPLICATION

With more efforts in recent years Photoactive nanonanostructures (NS), as important classes of nanomaterials, are currently being applied in several fields due to their unique properties. Among photoactive NS, gold nanostructure (AuNPs) are one of the most used for theranostic application for their peculiar intrinsic optical and chemical properties: they enable strong absorption light in the visible and NIR range, with high absorption coefficients (10^7 – 10^9 M/cm), which are much larger than those of most small dye molecules [1-2]. Those unique properties allow the development of novel and high sensitive biosensing platforms with the use of NS as transducer elements, to be implemented in electrochemical, optical and mass detection of interesting biomolecules, such pathogens and/or biomarkers. Plasmonic asymmetric nanostructures, such as nanoholes, and nanoprisms, also attracted the attention due to the confinement of electromagnetic field and the ability of conversion the adsorbed energy in different energy, such as thermal energy. The application of such structures in biosensing consent the easy surface biomodification for specific detection and the platform miniaturization for point of care development. Here, I report the surface plasmon resonance analysis of low-molecular weight biomarkers. The biosensing platform was developed using biofunctionalized gold surfaces for the reversible and oriented molecule immobilization[3]. SPR-imaging was used as forefront technique for the real-time monitoring of protein binding onto functionalized surface. Using the developed assay it is able to detect the biomarker at subnanomolar concentration. The described biosensing method depicts a general approach for the development of sensing methods for the detection of a wide range of small analytes that have a high potential interest in medical analysis.

[1] Photoactive Inorganic Nanoparticles. DOI: <https://doi.org/10.1016/B978-0-12-814531-9.00009-9>

[2] Nanostructured Hyperbolic Meta-Antennas enable arbitrary control of scattering vs absorption” Nano Lett., 2019 DOI: 10.1021/acs.nanolett.8b04841

[3] Surface analysis of gold nanoparticles functionalized with thiol-modified glucose SAMs for biosensor applications. Front Chem. 2016 Feb 29; 4:8. doi: 10.3389/fchem.2016.00008. eCollection 2016.

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