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From the engineering to the final application of asymmetric nanomaterials in detection: Rapid and ultrasensitive HEATSENS® thermal based biosensor development

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With more efforts in recent years, “nanoprobes” have been widely developed and extensively utilized for the labeling of biomolecules used for the detection of other various biological species of medical, pharmaceutical and environmental interest. In particular metal nanoparticles (such as AuNPs and AgNPs) and quantum dots have been used for the development of different biosensing platforms based mostly in electrochemical, optical and mass detection. However, the use of asymmetric noble-metal nanoparticles as thermal labels in biosensing was not explored before the development of HEATSENS®. The present advanced HEATSENS® sensing platform combines the peculiar properties of bioengineered Au-nanoprisms/nanorods of converting the IR light energy in quantifiable thermal energy with high efficiency, with their surface functionalization with detection antibodies. The combination of the use of asymmetric metal-nanomaterial with their oriented biofunctionalization, leads to an improvement of the sensing of the molecule of interest rising specificity and sensitivity up to the atto-molar concentration. Besides, due to the characteristic of converting the IR light to thermal energy, HEATSENS® sensing platform does not present interferences as it could happen using sensing methodologies based on electrochemical or optical detection. More in detail, HEATSENS® sensing platform has been applied to the detection of molecules of interest in the agro-food field, reaching the detection of analytes in complex matrices in the sub-femtomolar concentration in a short time of analysis. The characteristics of HEATSENS® sensing platform will lead to the development of low-cost detection devices/systems for point-of-care applications enable to be used in several other application fields such as public health, environment protection and homeland security.

Biography

Mariantonietta Parracino is the Nitbiosensing brand area Technical Manager at Nanoimmunotech. She obtained PhD in medical biochemistry at the University of Bari, School of Medicine. She has been working in several research institutions such as the Institute of Protein Biochemistry of CNR in Italy and The Institute of Consumer Protection (IHCP) of the Joint Research Center of the European Commission and as assistant professor at Aalborg University in Denmark. She is an author and co-author of peer reviewed papers and she holds two patents. She is specialized in surface nanofabrication and functionalization synthesis, chemical modification and characterization of nanomaterials, biomolecules characterization and modification for the development of biosensing platforms such as HEATSENS.

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