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BIOSENSORS FOR PANDEMICS

# AN INNOVATIVE FIBER OPTIC- SURFACE PLASMON RESONANCE (FO-SPR) BIOSENSOR AS A POTENTIAL TOOL FOR SARS-COV-2 DETECTION

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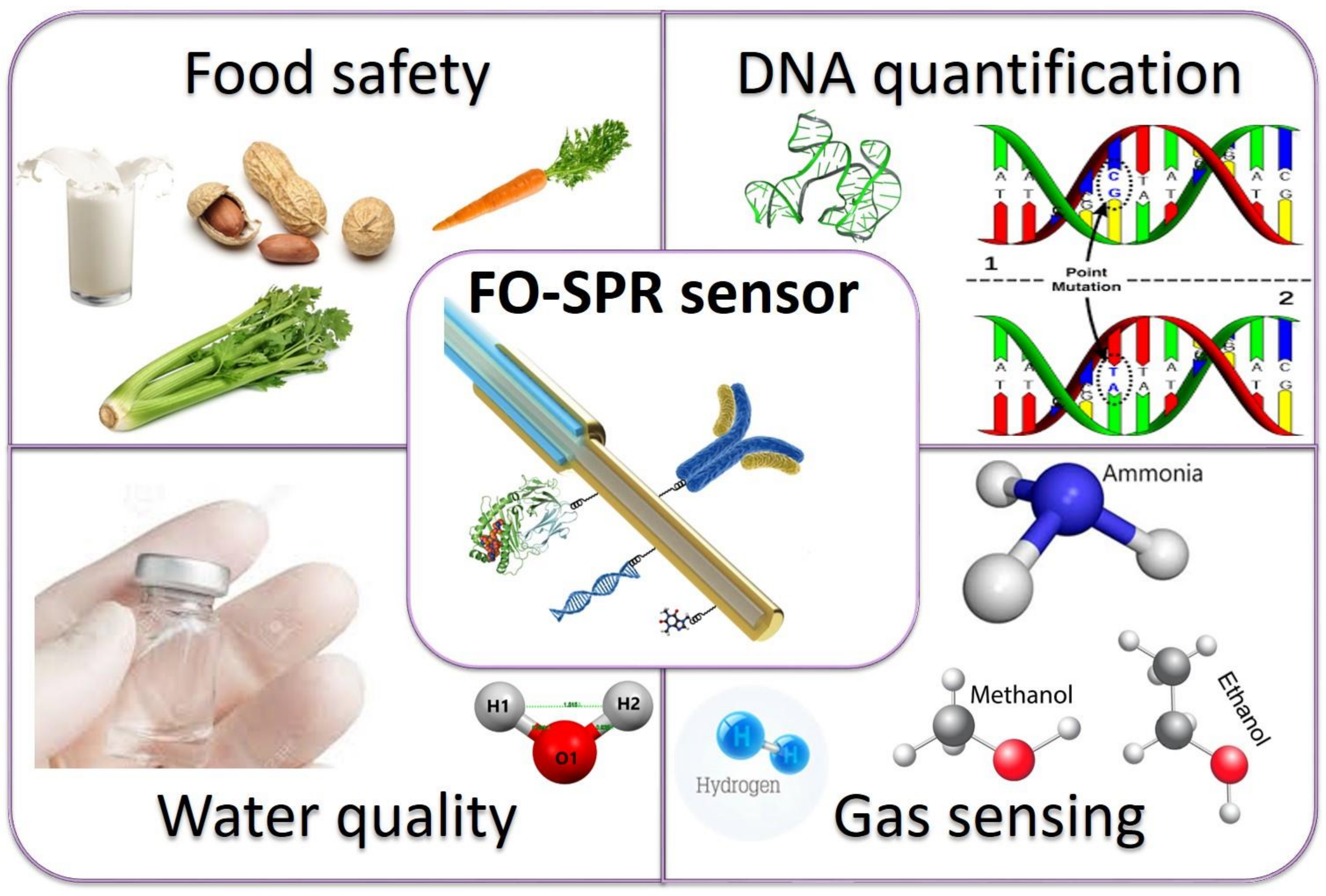
## INTRODUCTION

- ❖ In the actual context of the COVID-19 pandemic, there is a worldwide demand for performant, cost-effective and user-friendly biosensors, designed for sensitive, rapid and real-time identification of SARS-COV-2 coronavirus.
- ❖ The Fiber Optic Surface Plasmon Resonance (FO-SPR) sensing platform provides a flexible life science research tool for quantifying and studying biomolecular kinetic interactions of protein, DNA and small molecules [1].
- ❖ The FO-SPR technology was successfully used in various applications, some of which are: quantification of allergens, hormones and pathogens in food, gas detection, DNA mutation analysis, DNA amplification and quantification, water quality monitoring, therapeutic drug monitoring and influenza virus detection [1-4].
- ❖ The FO-SPR system will be employed to efficiently detect the SARS-COV-2 coronavirus, using both antibodies and aptamers as specific bioreceptors.




## FO-SPR SENSING PLATFORM

- ❖ The sensing platform consists of a computer, white light source, spectrophotometer, bifurcated optical fiber and the interchangeable FO-SPR sensor. The “in-house” developed FO-SPR sensing platform is presented in Figure 1.

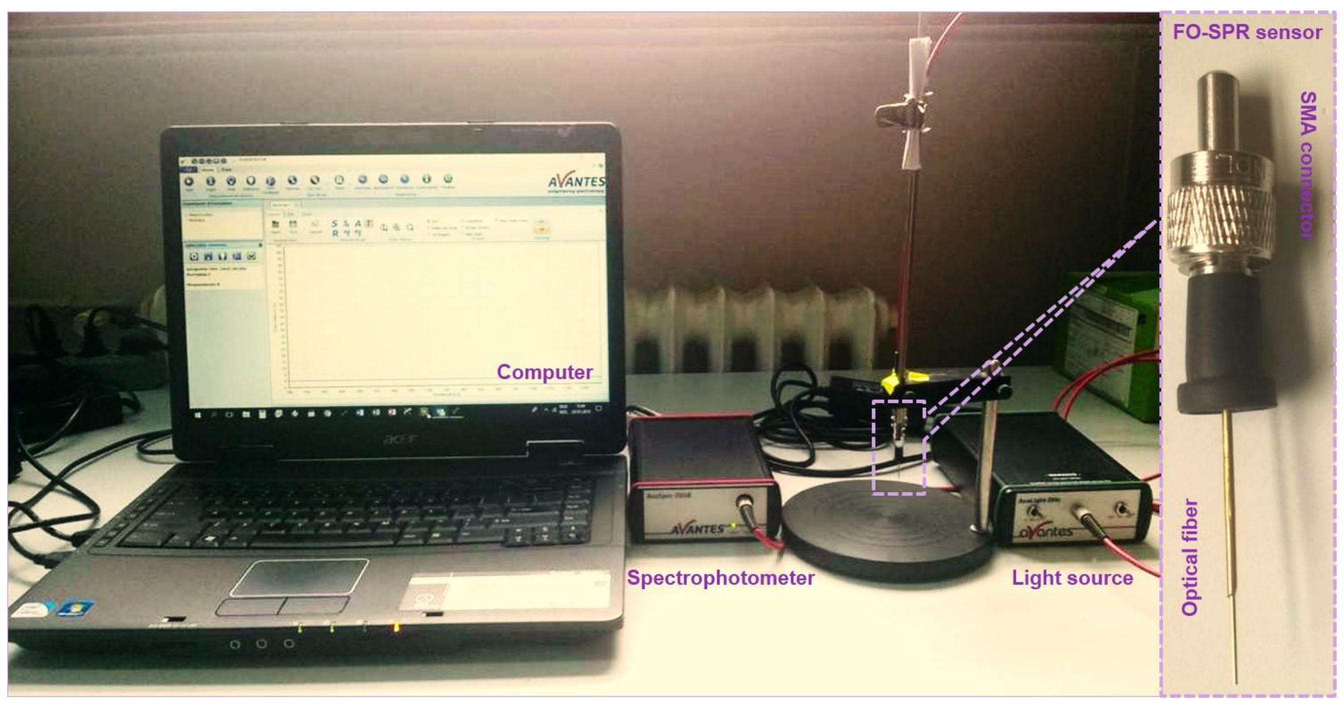



**Figure 1**: FO-SPR sensing platform.

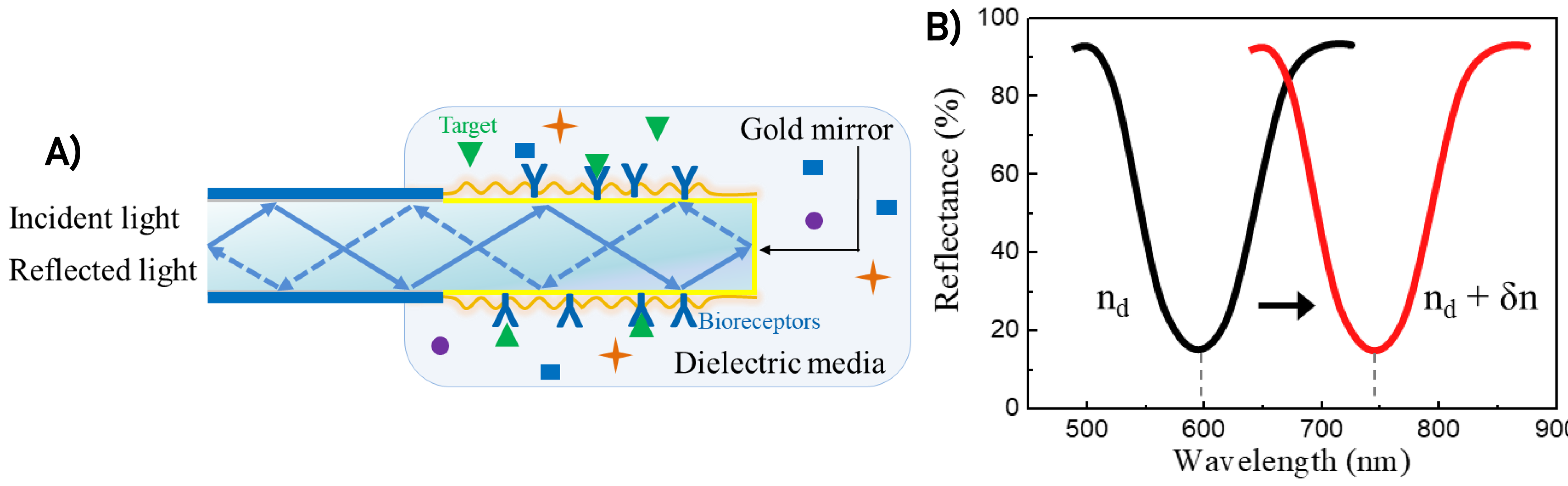
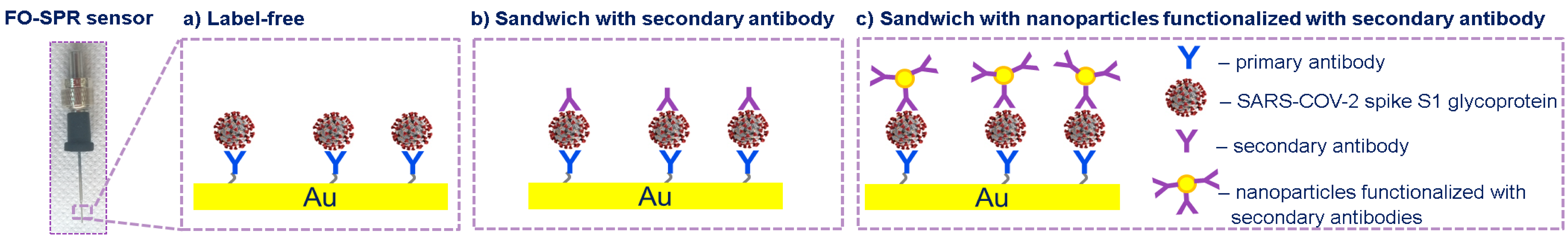



**Figure 2**: The FO-SPR system working principle: (A) Schematic of the FO-SPR biosensor; (B) typical SPR spectral dip response, where the wavelength is shifting as a function of refractive index changes at the sensor surface.

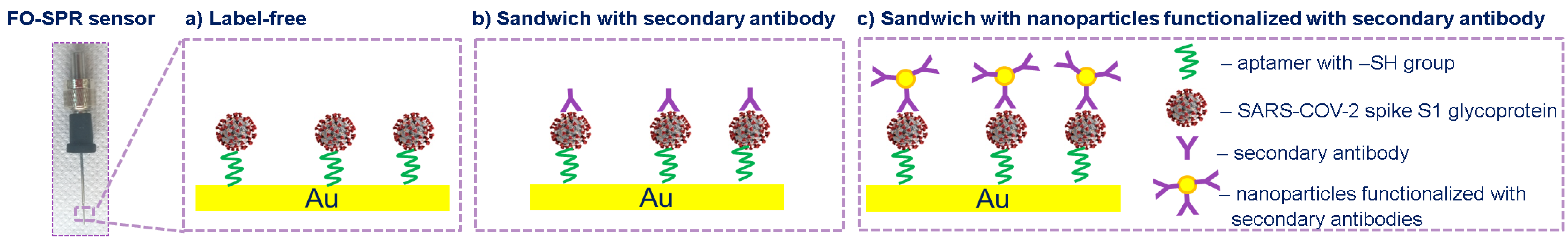
- ❖ Surface plasmons (SPs) are electromagnetic waves that form along the interface between a metallic thin film (eg. gold) and a dielectric medium (eg. solution containing the molecular target). SPs are very sensitive to the surrounding environment (eg. refractive index change).
- ❖ This sensing platform combines the SPR phenomenon with FO technology. A gold-coated FO is used to transport the light towards the plasmonic interface. Any binding events (e.g. bioreceptor-target interactions) at the gold surface will trigger a SPR signal response which can be processed into a graph (see Figure 2). The sensitivity of the sensor (calculated based on refractive index measurements in serial sucrose dilutions) is ~2500 nm/RIU.

## BIOASSAY STRATEGIES FOR SARS-COV-2 DETECTION

❖The FO-SPR system will be employed to efficiently detect the SARS-COV-2 coronavirus, using both antibodies and aptamers as specific bioreceptors.
❖The immunoassay implementation strategy for SARS-COV-2 detection:




❖The aptamer based bioassay implementation strategy for SARS-COV-2 detection:




❖It is expected that FO-SPR sensing performance competes with the state-of-the-art technologies (eg. PCR or ELISA) in terms of faster detection (less than 60 min) and higher sensitivity.

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