Nanophotonic biosensors: superior diagnostic tools for COVID-19 management

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Current sanitary crisis caused by the respiratory virus SARS-CoV-2 and the COVID-19 outbreak has evidenced the urgent need for rapid, accurate, and affordable diagnostic tests to monitor the population broadly and massively to properly manage and control the spread of the pandemic. Nucleic acid amplification tests (NAATs) remain as the standard technique for the diagnosis of active infection due to its specificity and sensitivity and despite their cost and relatively long time-to result. Rapid lateral flow tests (both antigen tests for active infections, and serological tests), are a remarkable alternative for rapid point-of-care diagnostics, but they exhibit critical limitations as they do not always achieve the required sensitivity for reliable diagnostics and surveillance. Next-generation diagnostic tools based on nanophotonic biosensors can overcome all these limitations: their potential for integration in compact autonomous devices make them very attractive to be delivered out-of-the-lab at the point-of-care (POC) and their superior performance can deliver highly sensitive, specific, and robust detection assays, providing quantitative information of the target analyte [1]. In this talk I will provide an overview of our current research focused on the implementation of our both photonic and plasmonic biosensors for COVID-19 diagnosis. In particular, we have designed biosensing strategies for (i) the direct, PCR-free detection of the viral genomic material, by direct hybridization to a DNA capture probe, (ii) the detection of intact virus entities by antigen-specific recognition of antibodies, and (iii) the detection of human antibodies against the virus antigens (serological tests).

REFERENCES

[1] Soler M., Estevez M.-C., Cardenosa- Rubio MC., Astúa A., Lechuga LM, ACS Sensors, 5 (2020) 2663-2678

FIGURE

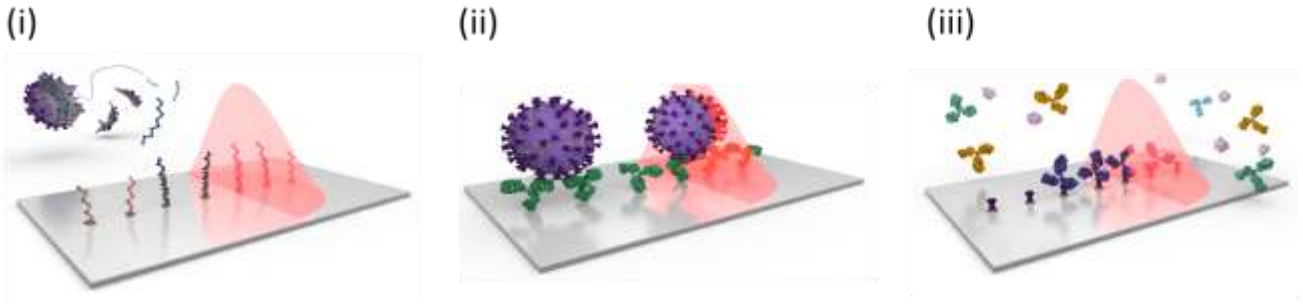

Figure 1: Detection strategies developed for the diagnosis of COVID-19 employing photonic and plasmonic biosensors (i) detection of viral genomic material; (ii) detection and quantification of the intact virus; (iii) detection of specific antibodies in serum (serological tests).