Developing label-free optical biosensors
as ultimate solution for diagnostics and biomedicine

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Abstract

Optical biosensors have emerged as a promising alternative for medical diagnostics, offering a versatile technology for rapid and sensitive analysis of biomarkers in a label-free format and integrated in point-of-care (POC) devices. Especially those based on (nano)plasmonics and silicon photonics have demonstrated an exceptional potential for tackling current challenges in POC testing, thanks to their robustness and reliability, high sensitivity, and simple adaptation to a large variety of targets, including proteins, nucleic acids, cells, or pathogens. However, their transfer and implementation in real scenarios, such as the clinical and healthcare practice, have not been accomplished yet.

In this seminar, I will provide an overview of the main technical considerations and challenges to be tackled in the development of label-free photonic biosensors for biomedical purposes, focusing on two main technologies, plasmonics and silicon photonic biosensors. Special attention will be placed on the surface biofunctionalization procedures and their importance toward the reliability and accuracy of the biomedical systems. Finally, we will review and discuss a few examples in the application of label-free optical biosensors for different health disorders, like cancer, infections, and cardiovascular diseases, among others.