Title: Characterization of the performance of optical label-free biosensors.

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Abstract:

The field of optical label free biosensors has become a topic of interest during past years, with devices based on the detection of angular or wavelength shift of optical modes [1]. Common parameters to characterize their performance are the Limit of Detection (LOD), defined as the minimum change of refractive index upon the sensing surface that the device is able to detect, and also BioLOD, which represents the minimum amount of target analyte accurately resolved by the system; with units of concentration (common units are ppm, ng/ml, or nM). LOD gives a first value to compare different biosensors, and is obtained both theoretically (using photonic calculation tools), and experimentally, covering the sensing area with fluids of different refractive indexes.

However, values of LOD for different sensors are generally not comparable since the total volume of fluid considered in each case varies from one device to another. For this reason, in this work is defined a new magnitude, BioFilm LOD, which limits the variation of refractive index to a fixed volume, equivalent no matter the typology of sensor considered. Besides, other figures of merit, such as Sensing Quality Factor, recently introduced [2], are discussed.

Finally, values of BioLOD found in the literature refer to particular bioapplications. There is a lack of a standard bioassay in order to compare sensors; in this work we propose a new model for, given a value of BioLOD for a bioapplication, estimating BioLOD for any other application, just considering its total size and the speed of the biorecognition reaction.

References:

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