Biosensing through surface enhanced Raman spectroscopy: A review on the role of plasmonic nanoparticle-polymer composites

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ABSTRACT

Surface enhanced Raman spectroscopy (SERS)-based biosensors attract substantial attention owing to their ultra-sensitivity and fingerprint capabilities compared to other optical sensing techniques. Recently, SERS biosensors based on polymer-plasmonic nanoparticles (P-PNPs) composites have demonstrated the capability to overcome the limitations that are hindering the development of conventional SERS biosensors such as poor reproducibility, complexity, and cross sensitivity among others. Consequently, investigations on the development of P-PNPs based SERS keep progressing actively. Here, we review the progress made in the SERS biosensors based on P-PNPs composites towards their practical applications. As a part of this effort, we summarized the primary methods for the synthesis and characterization of P-PNPs composites for the benefit of new researchers in the field. Further, the main SERS enhancement mechanisms as a function of P-PNPs based biosensors are detailed. More importantly, the recent advances in the development of P-PNPs based SERS biosensors are analyzed in terms of intrinsic and extrinsic detections and reported. The insights are concluded and the new questions for the SERS biosensors based on P-PNPs composites are appended in the outlook. A few solutions to the main obstacles hindering the conversion of laboratory investigations into the development of prototype and commercial SERS biosensors based on P-PNPs composite are also recommended.

KEYWORDS
In-situ and ex-situ synthesis; Intrinsic and extrinsic SERS biosensing; Optical biosensors; Plasmonic-polymer nanocomposite; SERS enhancement mechanism; SERS-based biosensors

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