Deposition of thin polypyrrole films on nanostructured porous silicon (PSi) interferometers for the development of optical sensing devices

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Abstract

Thin films of Polypyrrole (PPy) were obtained by chemical oxidation method under ambient conditions. Homogeneous and thin PPy films were uniformly fabricated at nano-level thickness on nanostructured Porous Silicon (PSi) substrates by two different approaches based on in situ vapor-phase and liquid-phase deposition. The synthesis of PPy films is aimed at the development of artificial receptors known as Molecularly Imprinted Polymers (MIPs), which can selectively interact with the target analyte with high specificity even in complex matrices. PSi displays Fabry-Perot fringe patterns whose reflection maxima vary spatially across the porous silicon. Its interactions with chemicals or biomolecules can be detected thanks to changes in the spectral interference patterns. Herein, we propose for the first time a new approach to integrate the selective characteristics of MIPs with the optical properties of PSi, with the goal of developing a robust, highly sensitive and selective optical sensor for the detection of targets of biomedical and environmental interest.

Keywords: polypyrrole, thin films, porous silicon, optical sensors

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