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Porous silicon biosensors based on reflectometric interference Fourier transform spectroscopy- theoretical foundations and experimental results

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Abstract

Porous silicon (PSi) biosensor based on reflectometric interference Fourier transform spectroscopy (RIFTS) has received a lot of attention due to its applicability as a label-free biosensor. In this approach, light is illuminated on the surface of a PSi layer and the interference pattern of all reflected beams from all interfaces is recorded. After exposing the PSi surface to bioanalyte, depending on analyte's size, it absorbs on the surface of PSi layer or penetrates to the pores and absorbs on the wall of the pores. This phenomenon causes variation in the refractive index of the interface of PSi/environment or in the refractive index of the layer respectively. As a consequence, decrease in peak intensity or shift in the peak position of fast Fourier transform of the interference pattern is observable, which can then be used as a key parameter for biosensing applications. In this work, theoretical foundations of RIFTS method were discussed. Then the experimental details of using this method for biosensing applications on modified porous silicon were described. Finally, experimental data for diagnosis of Osteocalcin protein, a piece of VKORC1 gen and Escherichia coli bacteria by RIFTS methods were illustrated.

Keywords: reflectometric interference Fourier transform spectroscopy, Fabry–Perot layer, porous silicon, biosensors

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