AN OPTICAL SENSOR FOR TRINITROTOLUENE BASED ON SURFACE PLASMON RESONANCE IN A PLASTIC OPTICAL FIBER-MOLECULARLY IMPRINTED POLYMER

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The possibility of implementing synthetic receptors (Molecularly Imprinted Polymers, MIPs) for sensing of low molecular weight substances by plasmonic resonance is presented. As a proof of principle, the explosive 2,4,6-trinitrotoluene (TNT) is considered, since a MIP for TNT has been successfully synthesized for electrochemical transduction [1].
In this investigation, a film of the same MIP was deposited on a Plastic Optical Fiber (POF) prepared by removing the cladding of the fiber, spin coating a buffer of Microposit S1813 photoresist on the exposed core, and finally sputtering a thin gold film over which the Molecularly Imprinted Polymer film was directly synthesized.
The transduction relies on the shift of the Surface Plasmon Resonance in the presence of TNT in the MIP phase. SPR [2, 3] is a very sensitive technique for determining small refractive index changes at the interface between a metallic layer and a dielectric medium, making possible label-free detection, which is very convenient for practical applications.
SPR transmission spectra obtained, normalized to the spectrum with air as the surrounding medium, clearly show that, when different concentrations of TNT enter in the MIP, the SPR phenomenon varies and the resonance wavelength is shifted to higher values. The shifting is proportional to the concentration of TNT in the sample solution.
The proposed sensing platform, being selective, low cost and relatively easy to realize, may be very attractive for the detection of 2,4,6-trinitrotoluene.

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