

Recent progress on optical fiber biosensors based on long period gratings

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Fiber optic label-free biosensors are currently experiencing wide diffusion, as they combine the performance of optical measurements with the advantages of optical fiber. This paper presents a comprehensive review about the design, development and testing of biosensor solutions based on in-fiber long period gratings (LPG). The attention is focused on optical transducers and methodologies allowing a significant enhancement of the sensitivity. Moreover, we report here about the development of a novel fiber optic biosensor based on unconventional LPG. The sensing platform is based on a long period grating (LPG) inscribed into a specialty double cladding fiber, whose sensitivity is enhanced through the mode transition phenomenon by chemical etching of the fiber outer cladding. The LPG is further covered with a nanosized layer of graphene oxide, providing carboxylic functional groups for the covalent immobilization of a vitamin D specific antibody. The testing was conducted using the major circulating form of vitamin D3, i.e., 25-OH-D3 (molecular weight ~400 Da), for which concentrations within 10-1000 ng/mL in buffer solution were measured. A limit of detection of medical interest lower than 10 ng/mL was attained.

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Biography
Agostino Iadicicco received the Ph.D. degree in information engineering in 2005. He is currently an Associate Professor with the Department of Engineering of the University of Naples Parthenope, Italy and serves as the Associate Editor for the IEEE Sensors Journal. His research activity has been focused on optoelectronics and photonics devices for sensing applications. He is currently involved in the design, realization and testing of novel in-fiber devices in standard and unconventional fibers including polarization maintaining and photonic bandgap fibers.