IOP PUBLISHING JOURNAL OF OPTICS

J. Opt. **12** (2010) 015005 (4pp) doi:10.1088/2040-8978/12/1/015005

A selectively coated photonic crystal fiber based surface plasmon resonance sensor

Xia Yu[1], Ying Zhang[1], Shanshan Pan[2], Ping Shum[2], Min Yan[3], Yehuda Leviatan[4] and Changming Li[5]

[1] Singapore Institute of Manufacturing Technology, 71 Nanyang Drive, 638075, Singapore
[2] Network Technology Research Center, Nanyang Technological University, 50 Nanyang Drive, Research TechnoPlaza, 4th Story, 637553, Singapore
[3] Department of Photonics Engineering, Technical University of Denmark, DK-2800 Kongens Lyngby, Denmark
[4] Department of Electrical Engineering and the Russell Berrie Nanotechnology Institute, Technion, Haifa 32000, Israel
[5] School of Chemical and Biomedical Engineering, Nanyang Technological University, 70 Nanyang Drive, Singapore 637457

E-mail: xyu@SIMTech.a-star.edu.sg

Received 11 August 2009, accepted for publication 12 November 2009
Published 2 December 2009
Online at stacks.iop.org/JOpt/12/015005

Abstract
We propose a novel design for a photonic crystal fiber based surface plasmonic resonance sensor. The sensor consists of selectively metal-coated air holes containing analyte channels, which enhance the phase matching between the plasmonic mode and the core-guided mode. Good refractive index sensitivity as high as 5500 nm/RIU (refractive index unit) can be achieved in the proposed structure. Compared with the entirely coated structure, the selectively coated sensor design demonstrates narrower resonance spectral width. Moreover, the greater resonance depth can improve the sensing performance in terms of signal to noise ratio (SNR). The improvements in spectral width and SNR can both contribute to a better detection limit for this refractive index sensor.

Keywords: photonic crystal fiber, surface plasmon, refractive index sensor

(Some figures in this article are in colour only in the electronic version)