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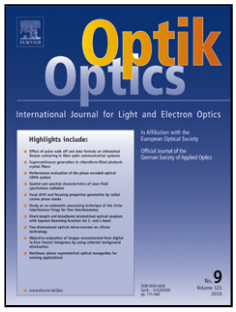

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Transverse magnetic-reflected polarizer for application in surface plasmon resonance configuration

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ABSTRACT

We developed a wideband transverse magnetic (TM) -reflected polarizer composed of BK7 prism and Ag/Cr/TiO_2 film. Based on the polarization-dependent loss of coupled plasmon-waveguide resonance (CPWR), BK7 prism/Ag/Cr/TiO_2/air layered structure can reflect the TM-components of lightwave and severely attenuate the transverse electric (TE) -components in a wavelength range from 600 nm to 900 nm at incident angles greater than the critical angle of total reflection. In terms of its practical application, a compact, low cost surface plasmon resonance (SPR) configuration with an integrated polarizer for wavelength modulation is presented and experimentally demonstrated.

Keywords: surface plasmon resonance; polarizer; integrated structures

1.Introduction

A polarizer is an essential optical device for most optical systems. Typically, polarizers are used in SPR apparatus to enhance SPR signals by generating TM-polarized incident lightwave[1,2]. Unfortunately, commercial available polarizers are usually bulky, expensive and difficult to be incorporated as integrated components. Polyvinyl alcohol (PVA)-based polarizer is slim and widely used in liquid crystal displays[3], but its chemical durability will be challenged when it serves as an integrated polarizer in SPR chemo-sensing or bio-sensing system. A miniature polarizer has been incorporated into SPR transducer for angular modulation to form a highly compact structure [4]. However, there has been no attempt to integrate a polarizer into Kretschmann SPR configuration for wavelength modulation, for which purpose, the polarizer should be miniature or compatible with SPR configuration and have following characteristics: output TM-polarized lightwave, sufficient spectral range, tolerable extinction ratios and appropriate operating angles.

In coupled plasmon-waveguide resonance (CPWR) configuration, a dielelctric film with an appropriate thickness is used as an overlayer above the metal surface. The CPWR can be excited by either TM- or TE-polarized waves, and the two resonances are separate and occur at different dielelctric thicknesses [5]. In frequency domain, after the dielelctric thickness is selected suitably, the spectral reflectivity of TE-polarized waves will exhibit a dip at a fixed incident angle while TM-polarized waves exhibit relatively high