Investigation of the Performance of an SPR-Based Optical Fiber Sensor Using Finite-Difference Time Domain.

ABSTRACT

Finite-difference time domain (FDTD) method was used to investigate the performance of surface plasmon resonance (SPR)-based optical fiber sensors. The results show that the performance of the fiber sensor can be optimized by choosing a proper combination of metal layer thickness of 40–60 nm and residual cladding thickness of 400–500 nm. Furthermore, the roughness effect of the gold surface layering the fiber sensor is significant in rough surfaces when sigma rms is greater than 5 nm or correlation length is lower than 100 nm.

Keyword: Optical fiber sensor; Surface plasmon resonance; Finite-difference time domain; Refractive index; Surface roughness