

Impact of Taguchi Optimization in Fiber Surface Plasmon Resonance Sensors Based on Si₃N₄ Layer

General and Applied Physics Published: 17 March 2022 52, Article number: 80 (2022)

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Abstract

This article exhibits a fiber plasmonic sensor based on a silver (Ag) layer and a silicon nitride (Si₃N₄) layer with a wide dynamic range of refractive index sensing. The Taguchi (L9) orthogonal array method is applied to optimize the design parameters such as fiber core, sensing region length, and the thickness of Ag/Si₃N₄ layers. The performance of the structure is investigated for the full-width half maxima (FWHM) as the smaller the better (STB). The smaller FWHM favors accurate detection, high-quality factor, and better sensitive detection of biomolecules. With the use of analysis of variance (ANOVA), it is evident that for the normalized transmitted power, the Ag layer thickness contributes