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Macro-bending Effect of Single-Mode Fiber for Glucose Sensor

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Abstract

This work presented the design of a glucose sensor using macro-bend single mode fiber to observe its sensitivity towards various glucose solution concentrations. The single-mode macro-bend fiber acts as a sensing element by wrapping it around a mandrel of various diameters representing the bending radius ranging from 7 mm to 20 mm and the number of turns was fixed to 3 turns. The Amplified Spontaneous Emission (ASE) light beam is transmitted through the sensing element to observe the transmission spectrum of the output light through the Optical Spectrum Analyzer (OSA) for characterization. The most suitable bending radius with a significant output power was chosen as the sensor. The macro-bend single mode fiber is then immersed in a glucose solution with various concentration to observe its sensitivity as a glucose sensor. The performance of this sensor is determined by analysing the difference in output power and the refractive index (RI) of the glucose solution's concentration. The results demonstrated a sensitivity of -106.68 dBm/RIU with a linearity of 98.34% when the bending radius is 7 mm, with the number of turns being 3 turns. © 2023 IEEE.

Author Keywords

glucose sensor; Macro-bending; refractive index; single mode fiber

Index Keywords

Glucose, Glucose sensors, Light transmission, MEMS, Single mode fibers, Spectrum analyzers; Bending effect, Bending radius, Glucose solution, Macro bending, Macro-bend, Output power, Sensing elements, Single mode, Single-mode fibers, Solution concentration; Refractive index

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