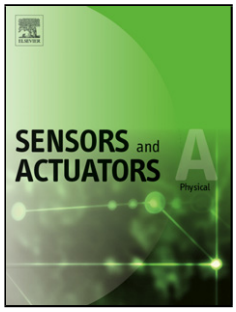

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Tapered Fiber Coated with Hydroxyethyl Cellulose/Polyvinylidene Fluoride Composite for Relative Humidity Sensor

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Abstract

A new evanescent wave based sensor is proposed and demonstrated using a silica fiber interferometer coated with Hydroxyethyl Cellulose/Polyvinylidene Fluoride **(**HEC/PVDF) composite. The performance of the sensor is investigated for two different types of interferometer structure: inline Mach Zehnder Interferometer (MZI) with dumbell structure and non-adiabatic etched fiber. The measurement is based on interferometric technique where the transmission spectrum of the reflected light is investigated for changes in relative humidity. For instance, the resonant dip wavelength for MZI dumbbell shape increases from 1555.76 to 1556.34 nm as the RH increases from 10 to 80%. While, for etched SMF the resonant dip wavelength increases from 1554.58 to 1554.85nm as the RH increases from 10 to 80%. Both sensors demonstrated a linear shift especially within a range from 20 to 45%. It is found that the MZI-based sensor has a sensitivity of 0.0123nm/% with a linearity of 99.88% and limit of detection of 0.44%. On the other hand, the etched SMF structure also shows change in the resonant wavelength with the increase in RH. The tapered fiber based sensor has a sensitivity of 0.0074nm/% with linearity of 98.85% and limit of detection of 0.65%. The lower limit of