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

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2 **Tapered Fiber Coated with Hydroxyethyl Cellulose/Polyvinylidene Fluoride**
3 **Composite for**
4 **Relative Humidity Sensor**
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16 **Abstract**

17 A new evanescent wave based sensor is proposed and demonstrated using a silica fiber
18 interferometer coated with Hydroxyethyl Cellulose/Polyvinylidene Fluoride (HEC/PVDF)
19 composite. The performance of the sensor is investigated for two different types of
20 interferometer structure: inline Mach Zehnder Interferometer (MZI) with dumbbell structure and
21 non-adiabatic etched fiber. The measurement is based on interferometric technique where the
22 transmission spectrum of the reflected light is investigated for changes in relative humidity. For
23 instance, the resonant dip wavelength for MZI dumbbell shape increases from 1555.76 to
24 1556.34 nm as the RH increases from 10 to 80%. While, for etched SMF the resonant dip
25 wavelength increases from 1554.58 to 1554.85nm as the RH increases from 10 to 80%. Both
26 sensors demonstrated a linear shift especially within a range from 20 to 45%. It is found that the
27 MZI-based sensor has a sensitivity of 0.0123nm/% with a linearity of 99.88% and limit of
28 detection of 0.44%. On the other hand, the etched SMF structure also shows change in the
29 resonant wavelength with the increase in RH. The tapered fiber based sensor has a sensitivity of
30 0.0074nm/% with linearity of 98.85% and limit of detection of 0.65%. The lower limit of

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