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Thin films based one-dimensional photonic crystal for humidity detection

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Highlights

- One-dimensional photonic crystal was fabricated with depositing TiO₂ and SiO₂ thin films by e-beam evaporation.
- Simulation results show the resonant mode of the proposed photonic crystal moves to longer wavelength with the increase of humidity.
- The proposed humidity sensor based on thin films shows 21.6 nm wavelength shift when relative humidity ranges from 11 to 84%RH.

Abstract: We theoretically and experimentally investigated thin films based one-dimensional photonic crystal with detection of environmental humidity. The sensing elements are multilayer porous thin films deposited on fiber end face by e-beam evaporation. Theoretical simulation shows that the resonant mode of the photonic crystal shifts to longer wavelength due to the capillary condensation of thin films. Experimental results on humidity detection show that the wavelength shift reaches 21.6 nm when relative humidity ranges from 11 to 84%RH; especially the

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