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Fiber-Optic Temperature Sensor Based on Temperature-Dependent Refractive Index of Germanium-Silica Coating Stack

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We report on a novel fiber-optic temperature sensor based on the temperature-dependent refractive index of a germanium-silica (Ge-SiO_2) coating stack. The relationship between the reflectivity and the temperature-dependent refractive index of the Ge-SiO_2 coating stack at 1550 nm is theoretically investigated. A reflection-type fiber-optic probe with high sensitivity and wide response range is designed and fabricated by physical vapor deposition. Experimental results show that the reflectivity is linearly dependent on temperature in the range of −30 to 130 °C, and the sensor exhibits high sensitivity and structural stability in the range of 50 to 500 K.

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