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Mid-infrared T-shaped photonic crystal waveguide for optical refractive index sensing

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Highlights

The main achievements of this study can be summarized as follows:

- The T-shaped slot concept is utilized for the first time in order to design an optical sensor.
- The designed refractive index sensor has the highest sensitivity within the range of analytes' refractive indices $n=1.05-1.10$ with an average value of 1040 nm/RIU and the overall sensitivity corresponding to higher refractive indices $n=1.10-1.30$ takes the value around 500 nm/RIU.
- For a realistic PC slab structure, we determined an average refractive index sensitivity of 530 nm/RIU within the range of $n = 1.10-1.25$ and an average sensitivity of 390 nm/RIU within the range of $n = 1.00-1.30$.
- The proposed optical sensor has simple, fast excitation and detection mechanism that can be important for rapid label-free diagnosis in biochemical sensing applications.

The proposed sensor configuration in the present study may contribute to the widespread usage of biochemical applications. The results showed that our design is a sensitive and compact configuration and has a label-free detection method.

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