

Narrowband Perfect Absorber Based on Metal-Dielectric-Metal Stacks for Mid-IR Optical Gas Sensing

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March 2, 2023

Abstract

Mid-infrared absorbers based on metamaterials are investigated intensively for gas detection applications, owing to its ability to achieve excellent light absorption by manipulating electromagnetic waves. Herein, we present a metamaterial absorber for the ultra-compact optical gas sensor. This absorber has 99.9% absorption at 6.2 μm . The full width at half-maximum of the peak was 720 nm. As a sensor, the absorber had an average linear spectral sensitivity of 876 nm/RIU and a detection limit of 1.141×10^{-5} RIU, when the RI of the gas medium varied between 1 and 1.05. The designed absorber would have great potential application in guiding the design of optical gas sensors.

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