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Dual-band infrared plasmonic metamaterial absorber for ultrasensitive refractive index sensing applications

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We present the design of a dual-band infrared plasmonic metamaterial absorber (MMA) for ultra-sensitive refractive index sensing applications. The proposed dual-band MMA only consisted of an assembly of vertical-split-ring (VSR) structure array adhered on a continuous film. The MMA can achieve absorbance of 99.1% and 98.8% with quality-factor (Q-factor) of 16.4 and 19.8 at 163.6 THz and 258.8 THz, respectively. The physical origin of the observed dual-band absorption is elucidated through distributions of magnetic field at resonances. The designed dual-band MMA served as a refractive index (RI) sensor which can achieve sensitivity of 1518 and 959 nm/refractive index unit (RIU) with FOM of 189.75 and 79.91, respectively. The proposed dual-band MMA can be a desirable candidate for applications in the refractive index sensing detection and the enhanced infrared spectroscopy.

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