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## Broad band metal-insulator-metal (MIM) perfect absorber metasurface with cross-shaped nanoantennas in the near infrared region

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### Abstract

In this paper, a metal-insulator-metal (MIM) metasurface is proposed and the influence of various parameters on its absorption properties is investigated. This metasurface shows broadband perfect absorption of electromagnetic wave in the near infrared spectral region. The nanoantennas consist of two different gold rectangular bars in a unit cell. The most bottom layer is made of Au, and the middle spacer is a dielectric material. Numerical simulations based on the finite element method (FEM) show that by tuning the geometrical parameters of the cross-shape, such as the rotation angle and displacement of one of the bars, and also tuning the thickness of middle spacer, one can achieve more than 97% to 99.8% absorption over a 330 nm bandwidth, with correspondingly negligible reflectance. The near perfect absorption results from the destructive interference of successive internal reflections within the spacer and impedance matching between the metasurface and vacuum. This metasurface can be used as an infrared sensor and a perfect absorber.

**Keywords:** Metal-insulator-metal metasurface, Perfect absorber, Near infrared region, Crossed nanoantennas

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