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Plasmonic quarter-wave plate with U-shaped nanopatches

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Abstract: a plasmonic quarter-wave plate which is based on U-shaped silver nanopatches array in the near-infrared range is designed and presented by us. It utilizes localized surface plasmon resonances with an abrupt phase shift to achieve the desired phase modulation in the transmitted field. The optimized quarter-wave plate can perfectly convert a linearly polarized light to circularly polarized light, whose ellipticity reaches to 1 at the wavelength of 1.55 μm . The bandwidth, in which the ellipticity is larger than 0.83, is 120 nm. This structure offers an enormous potential applications in optical sensor systems, advanced nanophotonic devices and integrated optical circuits.

Keywords: Plasmonic; Quarter-wave plate; Polarization conversion; Nanopatches array.

1 Introduction

Polarization, one of the important characteristics of light, is crucial in all kinds of optical researches and applications. Researchers have been seeking for an efficient way to completely control the polarization state of light. Conventional optical components usually utilize a piece of birefringent material to produce phase retardation, such as traditional anisotropic waveplates, polarizers, chiral media and prisms, rely on the propagation effect to control the polarization of light. As a result, the conventional optical components are usually bulky and suffer from difficulties in

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