Metalens: designed from a single wavelength to multiband

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Metasurfaces have attracted significant attention for their ability to manipulate light at the subwavelength scale, offering unprecedented control over phase, amplitude, and polarization. Advances in metasurfaces have shown various applications such as imaging, holography and sensing. In particular, metasurface-based lenses (i.e. metalenses) have been extensively investigated, which offer unprecedented capability for the miniaturization of optical devices. For instance, an all-glass metalens with a diameter of 100 mm at the wavelength of 632.8 nm has been recently developed, which is 16.5 times lighter than the refractive lens counterpart and demonstrates astronomical imaging of the Sun and the Moon. However, the metalens designed for one wavelength suffers from chromatic aberration. Therefore, in order to overcome the chromatic aberration of a metalens designed only at a single wavelength without controlling the optical dispersion over a continuous bandwidth, broadband achromatic metalenses have also been proposed for focusing of light in the visible, near infrared, mid-infrared and other wavebands. Furthermore, a compound metalens is designed to accomplish optical focusing at wavelengths of 0.65 μm and 3.7-4.8 μm. The compound metalens exhibits achromatic focusing for multiband light in a large wavelength range, showing the capability of ultra-compact multiband optical manipulation. Additionally, the design methodology of the compound metalens meta-atoms is also applicable to other multiband optical modulation.

Short biography:

Yechuan Zhu received PhD from Northwestern Polytechnical University, Xi'an, China, in June 2019. He has been a teacher at Xi'an Technological University since June 2019. At present, he is an associate professor in Xi'an Technological University, Institute for Interdisciplinary and Innovation Research. He is focused on micro/nano optics. Recently, he is focused on flat optics and metasurfaces. The use of metasurfaces as a platform for flat optics demonstrates metalenses with superior aberration control compared to conventional diffractive optics and refractive optics, with much less thickness and complexity and ease of optical alignment.