

PROCEEDINGS

Achromatic Generation of White-Light Vortices by Spherulites

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ABSTRACT

Vortex beams have attracted considerable research interest and enabled a wide range of applications, spanning high-capacity optical communications, quantum information processing, super-resolution imaging, and optical trapping and manipulation. Metasurfaces, as a prominent platform for generating optical vortices, have garnered significant attention owing to their compatibility with on-chip integration and their capability to tailor the phase, amplitude, and polarization of light at the subwavelength scale. However, conventional metasurface-based approaches typically rely on sophisticated nanofabrication processes, which are both costly and time-consuming. Furthermore, their operational performance is predominantly governed by resonant responses of meta-atoms, resulting in intrinsically narrow bandwidths that constrain their utility in broadband and achromatic applications.

We demonstrate achromatic generation of white light vortex beam across the entire visible spectrum by harnessing the optical scattering properties of spherulites, which exhibit natural cylindrical anisotropy and transmission dichroism. Spherulites are radially symmetric, microscale crystalline aggregates formed via molecular crystallization. The spherulites display concentric birefringent textures capable of structuring light fields. Notably, under white-light illumination, this approach enables robust, broadband optical vortex generation, thus, opening up new possibilities for spatiotemporal vortex modulation, wavelength-division multiplexing of orbital angular momentum, and novel light-matter interactions over broad operating bandwidths [1].

KEYWORDS

White light; optical vortex; spherulite; achromatic

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References

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