Electromagnetic scattering by heterogeneous anisotropic structure of high-order Bessel vortex beam

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Due to their wide applications in microwave technology, integrated optics, and sheath, anisotropic media have been researched extensively over the recent years. With the development of material and processing technology, various anisotropic materials with more complex structures and compositions emerge. The scattering model of a homogeneous anisotropic sphere is not suitable for the description of the problem anymore. In this paper, an analytical solution to the scattering by the heterogeneous anisotropic structure illuminated by a high-order Bessel vortex beam is investigated. By means of the Fourier transform and additional theorem, the internal fields of the heterogeneous anisotropic-sphere periodic structure are expanded in terms of vector spherical wave functions. Combining this with the continuity boundary conditions for the tangential components of electromagnetic fields, the scattering coefficients of the heterogeneous anisotropic structure are solved. Compared with the results of the homogeneous anisotropic sphere, the correctness of the theory and the code are verified. The scattering by heterogeneous anisotropic structures with different compositions, structures, and numbers of particles are numerically analyzed. The orbital angular momentum spectrum of the scattered wave is presented to show the influence of the composition on the phase distortion. The research will provide significant foundation for anisotropic materials and their optical properties.

Preferred mode of presentation: Oral