Abstracts

The Electric Quadruple Contribution to the Circular Birefringence of Nonmagnetic Anisotropic Chiral Media: A Circular Waveguide Experiment

I.P. Theron and J.H. Cloete. "The Electric Quadruple Contribution to the Circular Birefringence of Nonmagnetic Anisotropic Chiral Media: A Circular Waveguide Experiment." 1996 Transactions on Microwave Theory and Techniques 44.8 (Aug. 1996 [T-MTT]): 1451-1459.

Constitutive relations which include electric quadruple terms, in addition to electric and magnetic dipole terms, are used to describe the "optical activity" in particular the circular birefringence, of an anisotropic chiral medium which is nonmagnetic. The resulting permittivity and chirality tensors are then used to predict the rotation of the polarization plane of a linearly polarized wave propagating in a circular waveguide filled with the medium. The numerical predictions were tested by measurements between 2.4 and 4 GHz on a 2 m long artificial crystal in a circular waveguide and it was found that the rotation of the polarization was within 13% of the predicted value-good agreement after considering the possible sources of error. It is thus established that the effect of electric quadruples must be included when modeling the optical activity of anisotropic chiral media in the long wavelength regime. The anisotropic chiral media which are dealt with here can be classified according to the crystallographic point groups to which they belong, and they may therefore also be considered to be artificial crystals.

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