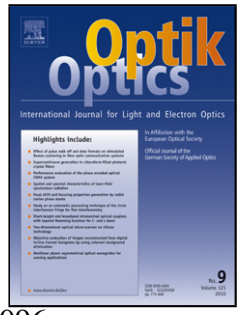

Title: Simulation of light interference by a biaxial thin film

Author: Masoud Rezvani Jalal Farzad Vaziri Alamdarlo

PII: S0030-4026(16)31246-3
DOI: http://dx.doi.org/doi:10.1016/j.ijleo.2016.10.096
Reference: IJLEO 58368

To appear in:

Received date: 17-8-2016
Accepted date: 24-10-2016

Please cite this article as: Masoud Rezvani Jalal, Farzad Vaziri Alamdarlo, Simulation of light interference by a biaxial thin film, Optik - International Journal for Light and Electron Optics http://dx.doi.org/10.1016/j.ijleo.2016.10.096

Simulation of light interference by a biaxial thin film

Masoud Rezvani Jalal, Farzad Vaziri Alamdarlo

Department of Physics, Malayer University, Malayer, Iran

Abstract

In this paper, the interference pattern of reflected light from a biaxial anisotropic thin film (with arbitrary orientation of the principal optical axes) is numerically investigated by a double-reflection approach. The pattern for different film thicknesses under illumination of monochromatic and white light with various polarizations in different angles of incidence is obtained. Comparison with isotropic thin films reveals that a kind of modulation (or banding) appears on the interference pattern.

Keywords: biaxial anisotropic medium, thin film interference, double-reflection.

1-Introduction

Biaxial anisotropic media are used in many optical components such as modulators, switches, filters and more recently in optical memories, omnidirectional reflectors and many other emerging applications [1-4]. Due to their growing variety and complicated physics, theoretical, numerical and experimental studies of such media are still in the focus of both geometric and wave optics [5,6].

A lot of effort has been put to study light interference by biaxial layers [7,8]. Analytical investigation by infinite-beam approaches is greatly simplified by 4×4 and 2×2 matrix methods [9,10]. However, such infinite-beam approaches are appropriate only when the incident light is completely coherent. In situations with low coherence or weak interfacial reflections, the inclusion of only two beams, i.e. one reflected from the front and the other reflected from the rear surface of the film, suffices to give the correct interference. Despite the extensive use of double-reflection approach to study light interference in isotopic films, one can hardly find its application in the biaxial films. In the present paper the interference pattern of a biaxial thin film is numerically calculated by the double-reflection method.

The paper is organized as follows: in the second section a brief introduction regarding electromagnetic waves in biaxial optical media is presented. The next section is devoted to simulation results and discussion of light interference by a biaxial film. Conclusions are drawn in the last section.