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Investigation of the factors influencing the parameters of polarizers based on multilayer interference coatings

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Introduction. Currently, multilayer thin-film polarizers have a wide range of applications in many fields, such as fiber-optic communication, optical imaging and liquid crystal displays. A combination of layers, the thickness of which is commensurate with the wavelength of the working spectral range, made of materials with some difference in refractive indices, make it possible to create polarizers. Such polarizers are capable of providing a significant difference between the reflection for the s and p components for a given wavelength at a known radiation incidence. In this paper, the influence of the angle of incidence of radiation and the coating design on the mismatch of the s and p components is shown. The paper presents a study of the influence of five factors that affect the characteristics of polarizers. The study was conducted using computer simulation.

Main Job. The paper considers the influence of the structure of the polarizing coating of the layers (the number of layers, their thickness, the materials from which they are made), as well as the angle of incidence of radiation and the working wavelength of the incident radiation.

We calculated the relative reflectivity of p and s directions for a five-layer coating, at an angle of 1 rad that gives a maximum mismatch 5133 times. And when we changed the layer number up to 11 without changing any other parameters, we can see the maximum mismatch drop to 1800 times. The structure influenced the layer performance a lot.

Conclusion. A(HLHLHLHLHLH)M of ZrO2/SiO2 are a structure expression (A means air, M means material, H means the material which has a higher index, while L means which has a lower index.), when we change the thickness of the first film in contact with air, we find that the contour map of the refractive index for this structure changes accordingly, and some areas have better characteristics than the structure at the default thickness. This means that the thickness of the film does not necessarily have to be (1/4) greater than the standard wavelength. By analogy, we can conclude that it is possible to simulate the influence of factors, including the refractive index of the material and the number of layers, on the polarization properties of the film using a computer.

Literature:

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