

Fourier polarimeter with increased sensitivity for measurement of small birefringence changes

Abstract

A method to measure the linear birefringence is proposed. The birefringence is measured indirectly as a phase difference between the eigenwaves of test medium. This phase difference can be observed as a phase of interference pattern realized using the polarizer. The presented method allows measuring the phase retardance with greatly increased sensitivity as compared to conventional polariscope systems: a very small change in the measured phase retardance triggers a large change in the geometric phase of the presented system. Furthermore, the sensitivity of the system can be controlled by slightly changing the mutual azimuthal orientation of the setup elements. The setup's increased sensitivity is accompanied by a decrease in the contrast of obtained fringes and can only be obtained in a limited measuring range. The fringe pattern is analyzed using a Fourier transform. The presented method allows measuring the two-dimensional distribution of a phase retardance using only one light intensity distribution. The study presents an analysis of the advantages and disadvantages of the measurement method, the factors affecting the quality of results and maximum sensitivity / accuracy achievable by this method.