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Tunable optical diode on the base of gyrotropic metamaterials in the ultrasound wave field

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Light oblique propagation through a gyrotropic metamaterials layer located in the field of two contradirectional ultrasonic waves are considered. The problem is solved by the Ambartsumian's layer addition modified method [1]. The diffraction in this case looks much richer, than in case of one ultrasonic wave. New regions of diffraction reflection appear in each diffraction order. The widths of the diffraction reflection bands, their number and frequency location, as well as their frequency distances are determined by the parameters of the medium and those of ultrasonic waves, and they potentially are controllable. It is shown, that the considered system can operate as a tunable optical diode.

Such systems can also be used as tunable polarization filters and mirrors, polarization mode converters, modal discriminators, circularly polarized wave multiplexers; they can be used as sources of elliptically polarized light; tunable optical diodes, and can be applied in lasers with tunable emission wavelengths. The possibilities of the parameters controlling the medium by changing ultrasonic wave parameters are examined.

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