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Carbon Nanotubes-Based Magneto-Optically Tunable Structure for Terahertz Wave Polarization Control*

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Terahertz time-domain spectroscopic polatimetry (THz–TDSP) method was used to study of polatization properties of a randomly oriented single-walled carbon nanotube (SWCNT) thin film on a high resistivity monocrystalline silicon (Si) substrate in terahertz (THz) frequency range under an external optical pumping and an external static magnetic field. Frequency dependencies of azimuth and ellipticity angles of a polatization ellipse and the polatization ellipse at various frequencies of the electromagnetic waves transmitted throught the Si substrate and the SWCNT on the Si substrate were obtained experimentally based on the system of the Stokes parameters. The results of the study of this magneto-optically tunable struture confirm the fact that, based on the Faraday effect in the SWCNT it is possible to devise efficient tunable THz polarization modulators for use in physics, chemistry, medicine, and the latest security and telecommunication systems.

Keywords: Terahertz time-domain spectroscopic polarimetry, single-walled carbon nanotubes, high resistivity monocrystalline silicon, polatization properties, Stokes parameters, Faraday effect.

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