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Y-30

DEVELOPMENT OF AN AUTOMATED PROTOTYPE OF THz FILTER BASED ON MAGNETIC FLUIDS

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Many new investigation approaches or techniques that rely on THz radiation are emerging today. It requires the development of devices for controlling THz radiation characteristics intensity, polarization, spectral properties, etc. One of the promising approaches to the implementation of such devices is the use of ferromagnetic fluids.

Earlier, the efficient operation of polarizers and non selective THz attenuators based on ferromagnetic liquids was demonstrated. The liquids used consisted of 5BDSR alloy particles obtained by the mechanical synthesis in a planetary mill or Fe particles obtained by the electric explosion, dispersed in synthetic engine oil. Magnetic fluids were controlled using an external magnetic field generated by Helmholtz coils.

In this study, we propose a prototype of a THz filter based on previously developed ferromagnetic fluids. Filter consists of a quartz or polymer cuvette with a magnetic fluid, several Helmholtz coils and a control circuit. This device allows one to orient the magnetic particles and to create ordered structures in the form of extended clusters. As a result, physical properties of electromagnets were optimized for effective controlling of particle clusters; the control process itself was automated. Spectral properties in the THz range are studied for various filter states. For reliable continuous operations, the device was supplemented with a homogenization system, based on mechanical mixing or sonication. The developed device can be used as a polarizer or an attenuator for polarized radiation in the range of 0.3-3 THz.

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Y-31

PHOTOLUMINESCENCE AND OPTICAL ABSORPTION OF DIAMOND SAMPLES CONTAINING NV CENTERS

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NV center is an impurity defective complex in diamond, obtained by irradiating with high-energy electrons samples containing nitrogen in a substituting position and post radiating annealing. NV centers are observed in several charge states negative (zero phonon line at 638 nm), neutral (ZPL at 575 nm), and, possibly, positive (ZPL at 533 nm) [1]. NV centers in diamond are candidates for qubits for quantum computing, the basis of high speed magnetometric sensors, sources of single photons, and also emitting centers of optically active laser media [2].

The optical absorption and photoluminescence spectra of several diamond samples containing NV centers in negative and neutral charge states are studied. The temperature dependences of the spectra were examined in the temperature range 12–470 K. The transmission spectra were measured using a halogen lamp. The photoluminescence spectra were measured with excitation by continuous-wave lasers in the visible range. The nature of the obtained dependences is discussed.

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