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Abstracts

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This book contains the materials on the fundamental and applied problems of pulsed lasers. It may be interesting for researches and engineers working in the sphere of quantum electronics, spectroscopy, plasma physics, medicine, remote sensing and laser technologies.

Designed by *Kirill O. Osiev, osiev@inbox.ru*

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birefringence has a satisfactory level B = 0.0025. Another advantage is the absence of phonon absorption peaks in the long wavelength part of THz range (> 500 μm) known to be free of water vapor absorption. Besides, Ga_2S_3 crystal demonstrates 30 times higher optical damage threshold. Its high mechanical properties allow processing, out-of-lab and commerce applications after improvement of the growth technology.

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STUDY OF HOT CARRIER RELAXATION IN NARROW-GAP SEMICONDUCTORS WITH TIME-RESOLVED TERAHERTZ SPECTROSCOPY

V.D. Antsygin[1], A.A. Mamrashev[1], N.A. Nikolaev[1], and O.I. Potaturkin[1, 2]

[1]Institute of Automation and Electrometry SB RAS, 1 Koptyug Ave., 630090 Novosibirsk, Russia;
[2]Novosibirsk State University, 2 Pirogova Str., 630090 Novosibirsk, Russia

Ultrafast relaxation of hot charge carriers in semiconductors is the main process that determines functional properties and limiting capabilities of electronic and optoelectronic devices. This process is especially significant for operation of nanodevices when their size becomes compared to the free length of charge carriers.

We implemented the method of time-resolved terahertz spectroscopy based on Ti : Sapphire femtosecond laser (central wavelength – 800 nm, pulse duration – 35 fs, pulse power – 3 mJ). Preliminary excitation of narrow-gap semiconductors (InAs, InSb) was carried out with terahertz pulses and/or optical pulses converted from Ti:Sapphire laser radiation. The state of charge carriers was probed by measuring terahertz absorption spectrum of semiconductors with subpicosecond time resolution. The studies using terahertz pre-excitation showed that the rate of impact ionization in the electric field of < 20 kV/cm of half-period terahertz pulse was thrice as fast at 300 as at 80 K. This is caused by an increased ionization threshold at lower temperatures which is proportional to the width of bandgap at the Γ, L, and X points of Brillouin zone. Pre-excitation with optical photons with different energies showed that the time of momentum relaxation and thermalization of hot photocarriers was 150 fs for Γ-valley and > 1.5 ps for L-valley carriers. We also studied influence of kinetic energy of hot charge carriers on the rate of impact ionization with simultaneous excitation of semiconductors with terahertz and optical pulses.

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MODEL STUDIES OF THz-RANGE GENERATION BY DOWN-CONVERSION IN GASE И GASES CRYSTALS

D.M. Lubenko[1,2], V.F. Losev[1,2,3], Yu.M. Andreev[2,4], and G.V. Lanskii[2,4]

[1]High Current Electronics Institute SB RAS, 2/3 Academicheskiy Ave., 634055 Tomsk, Russia, lideru@gmail.com;
[2]Tomsk State University, 36 Lenin Ave., 634050 Tomsk, Russia;
[3]Tomsk Polytechnic University, 30 Lenin Ave., 634050 Tomsk, Russia;
[4]Institute of Monitoring of Climatic and Ecological Systems SB RAS, 10/3 Academicheskiy Ave., 634055 Tomsk, Russia

Detailed model study of not phase matched and phase matched optical rectification or down-conversion of ultrashort Ti : Sapphire laser pulses at 950 nm into THz range in pure and S-doped GaSe single crystals is carried out. First, the ordinary and extraordinary wave dispersions of the GaSe refractive indices were measured by terahertz time-domain spectroscopy (THz-TDS). Measured data were approximated in the form of Sellmeier dispersion equations for 0.62–2000 βm range with using available shorter wave data. Different types of three-frequency interactions are considered. Dispersions, estimated phase-matching conditions and frequency conversion efficiencies will be presented in graphical forms.