

Terahertz radiation from narrow gap semiconductors photoexcited by femtosecond laser pulses

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Systematic investigation of THz radiation in differently doped InAs and various compositions of $\text{Cd}_x\text{Hg}_{1-x}\text{Te}$ was performed for the first time. Terahertz radiation from $\text{Cd}_x\text{Hg}_{1-x}\text{Te}$ and InAs samples excited by femtosecond Ti:sapphire laser pulses was measured by using an ultrafast photoconductive antenna manufactured from low-temperature grown GaAs. The samples investigated were n- and p-type single InAs crystals with the doping levels varying between 10^{16} and 10^{19} cm^{-3} and $\text{Cd}_x\text{Hg}_{1-x}\text{Te}$ epitaxial layers with $x=0, 0.2,$ and 0.3 . Large increase of the emitted terahertz power has been observed for p-InAs samples with the p-doping levels of approximately 10^{16} - 10^{17} cm^{-3} . This increase was explained by a large surface depletion layer and an electric-field-induced optical rectification effect in this layer. Terahertz fields radiated by the samples of all three investigated $\text{Cd}_x\text{Hg}_{1-x}\text{Te}$ layers was of the same order of magnitude. No azimuthal angle dependence of the radiated signal was detected, which evidences that linear current surge effect is dominating over non-linear optical rectification. Azimuthal angle and magnetic fields emission witness that it is caused by linear photo-Dember type processes.

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