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Title:Ultrafast carrier response of Br⁺-irradiated In_{0.53}Ga_{0.47}As excited at telecommunication wavelengths

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Abstract:We present results of infrared pump-terahertz probe experiments applied to a set of In_{0.53}Ga_{0.47}As films irradiated with heavy ions (Br⁺) at doses from 10⁹ to 10¹² cm⁻². Photoexcitation at 1400 nm (0.89 eV) allowed us to characterize the response close to telecommunications' wavelengths whilst avoiding the intervalley carrier scattering observed when a shorter wavelength excitation is used. The excitation fluence was varied in our experiments in order to characterize the dynamics in detail: the lifetimes and mobilities of both electrons and holes were retrieved, and the trap filling and carrier diffusion were clearly observed. The In_{0.53}Ga_{0.47}As film irradiated by the dose of 10¹² cm⁻² exhibits simultaneously ultrashort electron lifetime (\sim 300 fs) and very high electron mobility (2800 cm²V⁻¹s⁻¹). These findings are particularly important for the design of terahertz emitters controlled by lasers operating at standard telecommunication wavelengths. © 2012 American Institute of Physics.

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