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Ultrafast optical injection of magnetization in non-magnetic semiconductors F. NASTOS, R. NEWSON, H. M. VAN DRIEL, J. E. SIPE, Department of Physics, University of Toronto — We discuss the optical injection of magnetization into a nonmagnetic semiconductor by absorption of circularly polarized light. A microscopic approach, based on Fermi's golden rule and $\mathbf{k}\cdot\mathbf{p}$ band models, is used to quantify the magnetization-injection rate in GaAs. We find that under usual experiment conditions, relevant to optical orientation, the magnetization-injection rate of holes is approximately 20 times larger than it is for electrons, which reflects the large hole magnetic moment. We then turn to the ultrafast excitation regime and explore the possibility that the injected magnetization can radiate a detectable THz field. Using a phenomenological approach for the magnetization relaxation dynamics, we predict that the THz field from optical orientation is at the limit of current THz detection technology.

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