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Theory of sub-picosecond light-induced demagnetization in GaMnAs and InMnAs[1] LUKASZ CYWINSKI, L.J. SHAM, University of California, San Diego — When a (III,Mn)V ferromagnetic semiconductor is excited by a strong laser pulse, its magnetization decreases on a sub- picosecond time-scale [1,2]. We explain such rapid magnetization dynamics by spin-flip scattering due to the sp-d exchange interaction between the hot carriers and the localized spins. We derive the equations for the dynamics of Mn spins and phenomenologically describe the energy and spin relaxation of carriers. For efficient demagnetization a large density of states and short spin relaxation time of carriers is necessary, so that the excited holes cause magnetization quenching. The calculation of demagnetization using spin-flip transition rates derived from the 6 band Luttinger model gives results in qualitative agreement with experiments.

1. J. Wang et al., Phys. Rev. Lett. **95**, 167401 (2005)
2. J. Wang et al, J. Phys.: Condens. Matter **18**, R501 (2006)

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