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Ultrafast Photoinduced Coherent Spin Dynamics in Ferromagnetic $Ga_{1-x}Mn_xAs/GaAs$ Structure[1] JINGBO QI, YING XU, ANDREW STEIGERWALD, NORMAN TOLK, Vanderbilt University, XINYU LIU, JACEK FURDYNA, University of Notre Dame, ILIAS PERAKIS, University of Crete — Ultrafast pump-probe magneto-optical spectroscopy is used to study coherent spin dynamics in the ferromagnetic semiconductor $Ga_{1-x}Mn_xAs$ systems. Above GaAs bandgap E_g, the temporal Kerr signal is found to be strongly dependent on pump photon polarization. This polarization dependence is attributed to spins of electrons photoexcited to the conduction band, and disappears for $E_{ph} < E_g$. Below the Curie temperature T_C of the $Ga_{1-x}Mn_xAs$ samples, the temporal Kerr rotation acquires an additional oscillatory component, attributed to the precession of the ferromagnetically-coupled Mn spins. This precession is observed for excitation above and below E_g, regardless of the pump polarization states. The detailed characteristics of this ferromagnetic precession are discussed in terms of the Landau-Lifshitz-Gilbert (LLG) model.

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