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Ultrafast Photo-induced Ferromagnetic Phase Enhancement in Ion Implanted GaMnAs INGRID COTOROS, University of California at Berkeley, Berkeley CA 94720 , JIGANG WANG, Lawrence Berkeley National Laboratory, Berkeley CA 94720, PETER STONE, OSCAR DUBON, DANIEL CHEMLA, University of California at Berkeley and Lawrence Berkeley National Laboratory, Berkeley CA 94720 — Ion implantation is a far less demanding doping technique than molecular beam epitaxy (MBE), with potential for large scale application. Using femtosecond UV pump/NIR probe, polar MOKE spectroscopy, we reveal enhancement of the ferromagnetic phase on the 100s of picosecond timescale, via laser excited transient carriers in ion implanted GaMnAs. Particularly, the temperature dependence of the dynamic magnetization enhancement in ion-implanted samples exhibits abrupt quenching at low temperatures, which is a strikingly different behavior than that observed in MBE-grown samples. We tentatively assign the observed effect to the quasi-2D confinement of Mn spins in the magnetic layer due to the non-uniform doping profile obtained by ion-implantation. We discuss the implications of our results on the change of spin scattering mechanism at low temperatures, which may provide new insights into the metal to insulator transition visible at low temperatures in magneto-transport measurements.

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