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Suppression of nuclear polarization in photon-irradiated GaAs M.R. FITZSIMMONS, B.J. KIRBY, F. TROUW, LANL, P.A. CROWELL, C. ADELMANN, S.D. FLEXNER, C.J. PALMSTROM, M. ERICKSON, UMn, J.A. BORCHERS, C.F. MAJKRZAK, W. CHEN, T.R. GENTILE, NIST, R. PYNN, UI — We measured the spin dependence of polarized neutron beams reflected by a GaAs sample at 20 K in a magnetic field of 250 Oe applied along the sample's surface normal. Neutron data were acquired with left and right circularly polarized light  $(0.25 \text{ W/cm}^2 \text{ and } 808 \text{ nm})$  illuminating the sample. These conditions yielded nuclear polarization in the same sample (before and after the neutron experiment) of several percent as evidenced by a shift of a peak in the optical Hanle curve. The neutron data exhibit a correlation with light polarization and thus nuclear polarization. Quantitative analysis of the spin dependence of the polarized neutron reflectivities indicates nuclei within 50 nm of the sample's surface are not polarized, and then nuclear polarization increases to a small value in the bulk. We attribute suppression of nuclear polarization near the sample's surface to the electric field in the depletion layer that inhibits binding of spin polarized carriers to donor sites and to the electric field gradient at the nuclei (induced by the electric field in the depletion layer) that depolarizes nuclei with quadrupole moments such as Ga and As.

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