Competition between cubic and uniaxial magnetic anisotropy in GaMnAs at low Mn concentrations L.V. TITOVA, M. KUTROWSKI1, X. LIU, R. CHAKARVORTY, W.L. LIM, T. WOJTOWICZ2, J.K. FURDYNA, M. DOBROWOLSKA, University of Notre Dame — We study the dependence of the cubic and uniaxial magnetic anisotropy terms in GaMnAs on hole concentration $p$ and temperature $T$. The Ga$_{0.99}$Mn$_{0.01}$As layers were grown on ZnSe buffers deposited on GaAs substrates, and co-doped by Be in the range $3.0 \times 10^{19} < p < 8.5 \times 10^{19}$ cm$^{-3}$. Due to small lattice mismatch the uniaxial and cubic anisotropy terms in these samples were comparable. The magnetic anisotropy was studied by polar magneto-optical Kerr effect, which allowed us to monitor the easy axis of magnetization. The results showed that the cubic anisotropy is highly sensitive to both $p$ and $T$. Specifically, in samples with high $p$ the cubic anisotropy term is dominant at low $T$, but decreases rapidly as $T$ increases. In sharp contrast, uniaxial anisotropy shows a much weaker dependence on $p$ and $T$, thus dominating at temperatures close to $T_C$ even in samples with high $p$. These results open the possibility of engineering magnetic anisotropy and the magnetization reversal process in GaMnAs by controlling $T$ and/or $p$.

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