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Magnetic Properties of $Ga_{1-x}Mn_x$ P-based Quaternary Ferromagnetic Semiconductors P.R. STONE, M.A. SCARPULLA, I.D. SHARP, E.E. HALLER, O.D. DUBON, University of California-Berkeley; Lawrence Berkeley National Lab, E. ARENHOLZ, Advanced Light Source, Lawrence Berkeley National Lab, J.W. BEEMAN, K.M. YU, Lawrence Berkeley National Lab — $Ga_{1-x}Mn_xP$ is a ferromagnetic semiconductor in which exchange is mediated by carriers localized in a Mn-derived impurity band [Scarpulla *et al.*, Phys. Rev. Lett. **95** 207204 (2005)]. Despite its non-metallic nature even for x$\sim$0.042, $Ga_{1-x}Mn_xP$ displays many properties that are not significantly different from those of the canonical system $Ga_{1-x}Mn_xAs$ including an approximately linear increase of the Curie temperature (T_C) with x and a strong spin polarization of the density of states at the Fermi energy. Here we report the effect of partial anion replacement by either S or As on the magnetic properties of $Ga_{1-x}Mn_xP$-based thin films. In $Ga_{1-x}Mn_xP_{1-y}S_y$ both T_C and X-ray magnetic circular dichroism decrease monotonically with y due to compensation of ferromagnetism-mediated holes by electrons introduced by S donors. Addition of sulfur significantly enhances the uniaxial magnetic anisotropy between in-plane <110>-type directions with increasingly harder [110] axes as y increases. Finally, we explore $Ga_{1-x}Mn_xAs_{1-y}P_y$ for which it has been predicted [Masek *et al.* cond-mat/0609158v1] that T_C will increase as y increases, thus providing a route to higher T_C based on the well-studied $Ga_{1-x}Mn_xAs$ system.

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