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Strain-Engineered Magnetic Anisotropy in Insulating, Ferromagnetic $\mathbf{Ga_{1-x}Mn_xP_{1-y}N_y}$ PETER R. STONE, OSCAR D. DUBON, University of California, Berkeley and Lawrence Berkeley National Laboratory, JEFFREY W. BEEMAN, KIN M. YU, Lawrence Berkeley National Laboratory, LUKAS DREHER, MARTIN S. BRANDT, Walter Schottky Institut, Technische Universitat Munchen — $Ga_{1-x}Mn_xP$ is a ferromagnetic semiconductor in which exchange is mediated by localized holes [Scarpulla *et al.*, Phys. Rev. Lett. **95,** 207204 (2005)]. We demonstrate a direct connection between the magnetic easy axis in Mn-doped GaP and epitaxial strain by a combined ferromagnetic resonance, X-ray diffraction and SQUID magnetometry study. The magnetic easy axis of $Ga_{1-x}Mn_xP$ is gradually rotated from the in-plane $[0\bar{1}1]$ direction towards the film normal [100] through alloying with isovalent N which changes the strain state of the film from compressive to tensile. For a nearly lattice-matched film the out-of-plane uniaxial anisotropy field is close to zero emphasizing the importance of epitaxial strain in determining this parameter. Both in-plane and out-of-plane magnetization reversal processes are explored by a simple model that considers the combination of coherent spin rotation and noncoherent spin switching. These results indicate that holes localized within a Mn-derived impurity band are capable of mediating the same anisotropic exchange interactions as the itinerant carriers in the canonical $Ga_{1-x}Mn_xAs$ system.

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