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Magnetic properties of layered III-VI Diluted Magnetic Semiconductors (DMS)[1] THOMAS PEKAREK, Physics, U. of N. Florida, I. MIOTKOWSKI, A.K. RAMDAS, Physics, Purdue U. — The new class of quasi-two-dimensional III-VI Diluted Magnetic Semiconductors (DMS) exhibits a rich collection of magnetic behavior. The $Ga_{1-x}Mn_xS$ system exhibits a 3-D spin-glass transition, which was unexpected given its four atom thick two dimensional structure. The best scaling fit was found for critical exponents ($\gamma = 4.0$, $\beta = 0.8$, and $\delta = 5.5$) similar to the three dimensional $Zn_{1-x}Mn_xTe$ system. $Ga_{1-x}Fe_xSe$ exhibits a prominent magnetic anisotropy over the temperature range from 10 to 400 K. Theoretical models for $In_{1-x}Mn_xSe$, $In_{1-x}Mn_xS$, and $Ga_{1-x}Mn_xS$ provide good agreement with experimental results over a wide range of temperatures and fields. The mechanism behind an unusually large thermal hysteresis ($\Delta T \approx 200$ K) in $In_{1-x}Mn_xSe$, which extends up to room temperature, is not completely understood at this time. Typically, thermal hysteresis in most materials has a $\Delta T \approx 20$ K occurring well below room temperature. The host III-VI semiconductors themselves are among the best non-linear optical materials.

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Thomas Pekarek
Physics, U. of N. Florida

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