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Writing magnetic phase and domain structure in FeRh by controlling lattice symmetry with strain doping T. ZAC WARD, ANDREAS HERKLOTZ, Oak Ridge National Lab, ANTHONY WONG, Univ. of Tennessee, STEVEN BENNETT, VALERIA LAUTER, Oak Ridge National Lab — Low energy helium ion implantation is an effective approach to strain doping materials which allows one to expand the out-of-plane lattice parameter in epitaxial films without vacancy generation or electron/hole doping the system [1]. The ability to control crystal anisotropy and overcome Poisson's drive to conserve volume can thus offer huge dividends in controlling magnetic properties due to magnetostrictive phenomena. We present recent studies on epitaxial FeRh films which demonstrate how controlling crystal symmetry in this important intermetallic material can be used to finely control magnetic properties. We find that the first order magneto-structural phase transition from antiferromagnetic to ferromagnetic can be directly controlled through single axis lattice expansion; this effectively allows us to dictate the transition temperature anywhere between 400K and 150K. Polarized Neutron Reflectometry (PNR) data and scanning Magneto-optic Kerr effect (MOKE) measurements will be presented which demonstrate that this phase control can be confined to a specific region of the film both in depth and/or lateral position. While this holds great promise for magnetocaloric applications, many possibilities remain for devising new functionalities and gaining a deeper understanding of material properties using this technique. [1]H.W. Guo, S. Dong, P.D. Rack, J.D. Budai, A.T. Wong, A. Herklotz, P.C. Snijders, E. Dagotto, and T.Z. Ward, Phys. Rev. Lett. 114, 256801 (2015). Funded by DOE-BES-MSED.

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