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Magnetic and Resistance Behavior at first order Magnetic Phase Transition in Fe47Rh47Pd6 Thin Films

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The properties of Fe47Rh47Pd6 epitaxial thin films grown on MgO(001) were studied as a function of growth temperature. Films grown above 400C exhibit a first-order magnetic phase transition with a transition temperature that decreases as the growth temperature is increased. The chemical order parameter of the Fe47Rh47Pd6 films is nearly independent of the growth temperature, while the lattice constants change slightly. A comparison of our structural, magnetic, and electrical transport results with theoretical and experimental results in the literature indicate that the transition temperature of FeRh-based alloy films depends sensitively on the lattice parameters, and is of electronic origin. The transition temperature and its width can be tuned over a wide range by controlling the crystal structure via growth conditions or post-deposition annealing.