Effect of Cu doping on the structure, magnetic properties of ordered FeRh-Cu thin films

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Abstract

Magnetic phase transition is an interesting phenomenon for the electronic device applications. Chemically ordered FeRh alloys thin film with the CsCl structure show a fascinating first order magnetic phase transition from the antiferromagnetic (AFM) to ferromagnetic (FM) states at around 370K upon heating at room temperature, accompanied by a large reduction in the resistivity, a large change in entropy and an isotropic volume expansion of about 1%.The phase transition of FeRh thin film can be controlled using different driving forces such as temperature, magnetic field, electric field, strain and spin-polarized current. In this work, we study the strain driven phase transition of FeRh thin films by doping Cu. The $FeRh_{100-x}Cu_x$ (x = 1~3 at%) thin films were grown on a single-crystal MgO (001) substrates by using magnetron DC co-sputtering from Fe, Rh and Cu targets. We used XRD to observe the strain effects with different Cu contents of FeRh thin film and used magneto-optical Kerr effect (MOKE) to measurement the phase transition temperature of FeRh thin films. By lattice constant change and peak of integration, we can obtain the strain effect information and ordaer parameter.Then we can understand the relationship between the phase transition and strain, order parameter.