Magnetism and magnetocrystalline anisotropy of FeRh(001) thin films

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In this paper we present magnetism and magnetocrystalline anisotropy of FeRh (001) films. They are found to depend strongly on film thickness and surface terminations. While magnetic ground state of bulk FeRh is G-type antiferromagnetism, the Rh-terminated films exhibit ferromagnetism with strong perpendicular MCA whose energy +2.1 meV/□ is two orders of magnitude greater than 3*d* magnetic metals, where □ is area of two-dimensional unit cell. The magnetic ground phases of FeRh bulk and thin films are revealed to be results of interplay and competition between three mechanisms – the superexchange interaction, the Zener direct-interaction, and magnetic energy gain. We will also discuss the thickness effects on magnetism and magnetocrystalline anisotropy of the FeRh(001) thin films.

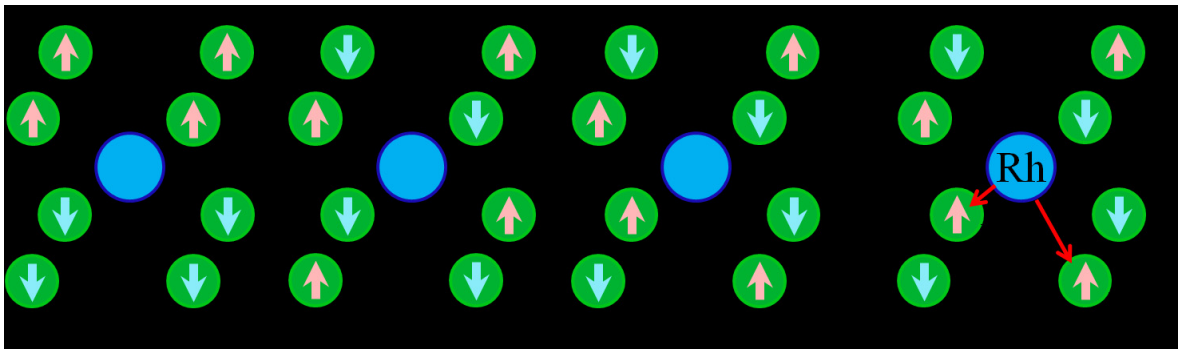

Fig. 1. Schematic diagrams of magnetic structures of (a) A-, (b) C- and (c) G-AFM states of bulk FeRh, and (d) exchange interaction between Fe atoms in the G-AFM state. Small bolls at the corners of cubic present Fe atoms and large balls at the center Rh atoms