Spin Texture Induced Response through Magnetoresistance in Ferromagnetic EuO_{1-x} and Helical Antiferromagnetic Eu Metal

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Abstract

In the field of spintronics, the manipulation of spin textures with electric currents and the magnetic field is an important challenge. Magnetic skyrmions which are highly stable under the proper condition are very promising as a basis for future spin electronic information storage. We have prepared thin films of Eu and EuO_{1-x} on Si (001) substrate by Pulsed Laser Deposition (PLD) using europium (Eu) metal as a target to examine its spin-dependent transport. In this talk, I will discuss a systematic transport study of EuO_{1-x} thin films as a function of exposure time in air, which reveals a gradually decreased T_C from 140 K to 70 K as the concentration of the oxygen vacancies decreases, which is accompanied by a drastic increase in the resistance. We also observed an unusual enhancement of magnetic anisotropy in the transport measurements and the abrupt change in the resistance as the direction of the field is changed from out-of-plane, which can be explained by the presence of spin-textures like skyrmions in EuO_{1-x}. I will also discuss the transport properties of helical antiferromagnetic Eu metal thin films. We observed the hysteretic oscillation in the magnetoresistance (MR), which is believed to be associated with the change in the distribution of the antiferromagnetic domains in Eu caused by the interplay of the applied magnetic field and the strain in the films.