Scientists enhance synthesis of chromium dioxide (100) epitaxial thin film growth

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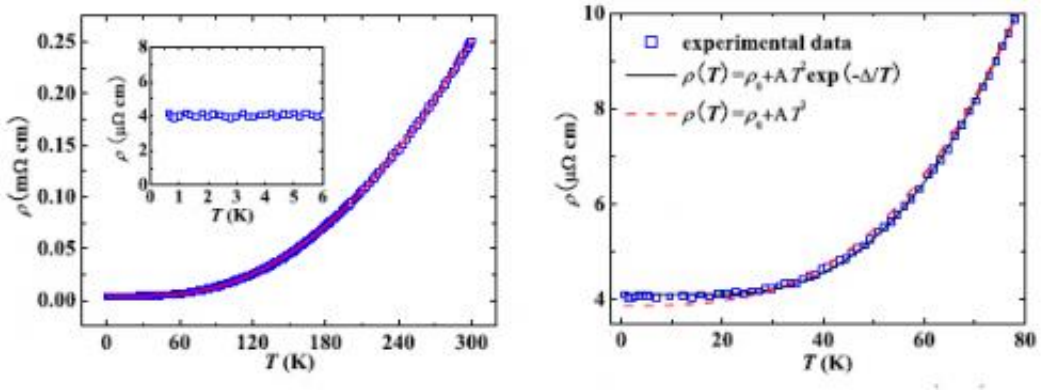

Temperature dependence of the resistivity of CrO2 film from 0.6–300 K. The solid line is the fitting result using ρ(T)=ρ0+AT2exp(-△/T). The inset is the enlarged part at low temperature; (b) A detailed comparison of fits at low temperature.

Half-metallic ferromagnet CrO2 has attracted much attention not only because of its fundamental physics related with high spin polarization but also because of its possible applications in the emerging area of spintronics.

In these applications, synthesis of CrO2 films is of fundamental importance, primarily because of the difficulty in its synthesis, as it is not known to form under ambient pressures in a pure form. Extensive efforts have been made to grow high quality CrO2 films, but the growth technology still deserves research.

The high quality CrO_2 film on the (100)-oriented TiO_2 substrate has been successfully fabricated using a simple route under ambient pressures in a pure form and the transport properties and the magnetic properties were also studied.

The high quality of the sample is indicated by the XRD patterns with the narrow width of 0.38o in the rocking curve of the (200) peak. The temperature dependence of resistivity can be fitted with $\rho(T)=\rho 0+AT2\exp(-\Delta/T)$ over the range of 0.6-300 K. The in-plane magnetic measurements show that the magnetization of the film becomes saturated in a relatively low field with a small coercive field. The temperature dependence of the magnetization follows Bloch's T3/2 law and the slope suggests a critical wavelength of $\lambda\Delta \sim 26.6$ Å beyond which spin-flip scattering becomes important.

More information: www.worldscientific.com/doi/pd … 42/S0218625X14500553

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