EB08

Electrically Driven Phase Transition in Multiferroic LuFe2O4

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Since the discovery of electronic ferroelectricity [1] and multiferroics [2] in the mixed-valence compound $LuFe_2O_4$, this material has drawn a lot of research interest. Here we report the effects of applied electric field on the electronic and dielectric properties of $LuFe_2O_4$. The measurements of resistance under various applied voltages as well as the highly nonlinear current-voltage characteristics reveal that a small electric field is able to drive the material from the insulating state to a metallic state. The threshold field at which the insulating-metallic transition occurs, decreases exponentially with increasing temperature. We interpret this transition as a consequence of the breakdown of the charge-ordered state triggered by applied electric field, which is supported by the dramatic dielectric response in a small electric field [3]. This electrically driven phase transition leads to a colossal electroresistance effect and a giant dielectric tunability around room temperature, which makes $LuFe_2O_4$ a very promising material for many applications.

This work is supported by National Key Basic Research Program of China (2007CB925003).

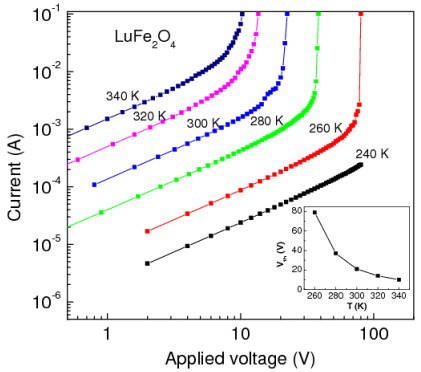

Fig. 1. I-V curves at various temperatures showing an electrically driven insulator-metal transition.

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EB09

Ellipsometric Study of $LuMnO_3$

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Temperature dependent optical properties of multiforroic LuMnO3 has been investigated. A variable angle spectroscopic ellipsometry was used for UV-VIS-NIR (0.7-6 eV) range. Temperature dependence were measured over wide temperature range from 4.2-800 K. Temperature dependence of anisotripic optical conductivities and dielectric constants were evaluated from the several configurations of principle angles and polarizing directions. New results with our enhanced methods are compared with the previous result with conventional reflectance measurement [1].

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