



“Twinning structure and enhanced ferroelectric properties of epitaxial BiFeO₃ (001) film”

by Mr. Liu Huajun

Date: 20th August 2009 (Thursday)

Time: 12:30pm to 1:00pm

Venue: E3-06-08

Abstract

Multiferroics, defined as materials with coexistence of at least two of the electric, elastic, and magnetic orders, have attracted enormous research activities recently. A subsystem of multiferroics is the ferroelectromagnet, which possesses both electric and magnetic orders. BiFeO₃ is one of the few materials which are both magnetic and a strong ferroelectric at room temperature. It has potential applications in information storage, spintronic devices and sensors.

In this work, epitaxial BiFeO₃ film was grown on the (001) SrTiO₃ single crystal substrate with a SrRuO₃ buffer layer by radio frequency magnetron sputtering. The ceramic target used for sputtering had a 10% bismuth excess to compensate the likely loss in association with evaporation at high temperature. Reciprocal space mappings obtained from high-resolution synchrotron X-ray diffraction revealed a twinning rotation structure of the film. The lattice of BiFeO₃ was still not fully relaxed even at 720 nm, which is monoclinic with lattice parameters $a = 5.610 \text{ \AA}$, $b = 5.529 \text{ \AA}$, $c = 4.031 \text{ \AA}$, $\beta = 89.34^\circ$. The radiant precise workstation (Radiant Technologies) and Keithley 6430 I-V system were used to measure the ferroelectric and leakage current behaviors of the film, respectively. The film shows an enhanced remanent polarization of $81 \mu\text{C}/\text{cm}^2$ and greatly reduced leakage current density of $1.2 \times 10^{-6} \text{ A}/\text{cm}^2$ at 100 kV/cm.

Mr. Liu Huajun Speaker

Mr. Liu Huajun obtained his Bachelor's degree in the department of Materials Science and Engineering from University of Science and Technology of China in 2008. Now, he is conducting research on ferroelectric thin films in Professor John Wang's group.

Dr Xue Jun Min Host

All are Welcome!