

Electrical properties of LaVO₃ thin films

Hyunkyu Ahn, Ji Hyun Park, Jaichan Lee†

School of Materials Science and Engineering, Sungkyunkwan University
(jcllee@skku.edu†)

LaVO₃ thin films have been deposited on SrTiO₃ and LaAlO₃ substrate by pulsed laser deposition. The structure of LaVO₃ thin films were measured by high-resolution x-ray diffraction. It indicated the epitaxial growth with (002) diffraction patterns on LaVO₃ thin films and substrate. After the film growth, we measured electrical resistivity of LaVO₃ thin films using van der Pauw geometry in the temperature range of 77 ~ 300 K. The resistivity vs temperature curve exhibited insulating behavior on LaAlO₃ substrate. However, it exhibited metallic behavior on SrTiO₃ substrate. To understand this phenomenon, we have investigated electronic reconstruction at the interface of the films and substrate.

Keywords: Mott insulator, Thin film

The Electrical properties of LaTiO_{3+δ} on LaAlO₃ substrate.

박지현, 이재찬†, 안현규

성균관대학교
(jcllee@skku.edu†)

Recently, Mott insulator such as LaMnO₃, VO₂, etc. has been widely studied because of their unusual properties. Especially, metal-insulator transition of Mott insulator has great potential for novel electric device like non volatile memory device. Metal-insulator transition of LaTiO_{3+δ} single crystal is widely investigated by many researchers. On the other hand, reports on metal-insulator transition of LaTiO_{3+δ} thin film are much less than single crystal bulk LaTiO_{3+δ} because stabilizing Ti³⁺ state is difficult. Ohtomo et al. reported that LaTiO_{3+δ} thin films grown on SrTiO₃ substrate have mixed Ti valence and exhibit metallic behavior because of electronic reconstruction. In this study, we successfully fabricated insulating state LaTiO_{3+δ} thin films on the LaAlO₃ substrate. To prevent charge reconstruction and oxygen vacancy at the interface, LaAlO₃ substrate is used. Structures of LaTiO_{3+δ} thin films are studied by x-ray diffraction. Pseudo-cubic LaTiO_{3+δ} thin films were epitaxially grown on LaAlO₃ substrate at ambient oxygen pressures below 10⁻⁴ Torr. The transport property of LaTiO_{3+δ} thin film was measured using the van der Pauw geometry in the temperature range 77 K < T < 300 K. The resistivity versus temperature curves exhibit insulator behavior below 10⁻⁵ Torr of oxygen ambient pressure. With increasing oxygen content (δ), LaTiO_{3+δ} thin film changes from insulator to metal with hole concentration of 2δ. When δ more increases, LaTiO_{3+δ} changes to a band insulator.

Keywords: thin film, mott insulator, Mltransition