Plasma source와 RF power에 따른 NiO 박막의 우선배향성 및 표면형상
The Evolution of Preferred Orientation and Morphology of NiO Thin Films under Variation of Plasma Source and RF Power

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NiO thin films are very attractive for use as an antiferromagnetic layer, p-type transparent conducting films, in electrochromic devices and functional sensor layer for chemical sensors, due to their excellent chemical stability, as well as optical, electrical and magnetic properties. In addition, (100)- and (111)-oriented NiO films can be used as buffer layers on which to deposit other oriented oxide films, such as c-axis-oriented perovskite-type ferromagnetic films and superconducting films, because of the similarity in symmetry of oxygen ion lattice and lattice constants between the NiO films and the oriented oxide films. Thus, controlling the crystallographic orientation and surface roughness of the NiO films for a buffer layer are very important.

In this study, NiO thin films were deposited on Si(100) substrates at room temperature by RF magnetron sputtering from a NiO target. The effects of plasma source and RF power on the crystallographic orientation and surface morphology of the NiO films were investigated. X-ray diffraction (XRD), field emission scanning electron microscopy (FE-SEM) and atomic force microscopy (AFM) were employed to characterize the deposited film. It was found that the type of plasma sources has affected the crystallographic orientation, deposition rate, surface morphology, and crystallinity of NiO films. Highly crystalline NiO films with (100) orientation were obtained when it deposited in Ar. On the other hand, (111)-oriented NiO films with poor crystallinity were deposited in O_2. Also, the increase in RF power resulted in not only higher deposition rate, larger grain size, and rougher surface but also higher crystallinity of NiO films, and showed dramatic effect of these for the films processed in Ar.

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