

## 반응성 마그네트론 스퍼터링으로 제작된 AlN 박막의 구조변화

## Thin film structure of aluminium nitride films prepared by reactive magnetron sputtering

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## 1. 서론

Aluminum nitride (AlN) films have received considerable interest because they have some important properties such as chemical stability, high thermal conductivity, wide direct band gap, extreme hardness, high melting temperature and high acoustic velocity. Thus, AlN films are used for surface passivation of thin film, insulating layers, optical sensors in the ultra violet (UV) Spectral range, and surface acoustic wave devices<sup>1-4</sup>. In this study, to consider the effect of incidence angle of depositing particle and substrate to target distance (d) on microstructure and surface morphology of AlN film, the films were prepared using the reactive magnetron sputtering technique with various deposition conditions. The microstructure surface morphology of the films were examined by X-ray diffraction (XRD), atomic force microscopy (AFM), and scanning electron microscopy (SEM), respectively.

## 2. 본론

AlN films were reactively deposited on the Si (100) substrates by reactive radio frequency (RF) magnetron sputtering for different incidence angles and distances between substrate and target. X-ray diffraction (XRD), atomic force microscopy (AFM), and scanning electron microscopy (SEM) were used to consider the influence of process parameters such as reactive gas flow rate, grazing incidence angle ( $\alpha$ ), and distance (d) between substrate and target surface on the property of AlN films. XRD results showed that AlN film prepared at a constant distance (d) of 3 cm and an incidence angle of  $45^\circ$  revealed a mixture of AlN (002), (100), and (101) planes, while the film prepared at  $\alpha = 0^\circ$  revealed a strong AlN (002) orientation which has a perpendicular growth direction to the substrate surface. AFM results showed that AlN film prepared at  $\alpha = 0^\circ$  exhibited more flat surface morphology than that of film prepared at  $\alpha = 45^\circ$ .

## 3. 결과

The influence of substrate to target distance and incidence angle of deposition particles on the preferred orientation and surface roughness of AlN films was investigated. The experimental results show that AlN film prepared at incidence angle of  $0^\circ$  and substrate to target distance of 3 cm shows strong (002) peak. However as substrate to target distance increased from 3 to 10 cm, AlN films showed mixed orientation with AlN (100), (002), and Al (111) peaks in the XRD pattern. A correlation between incidence angles and surface roughness of the film was also observed. The increase in incidence angle results not only in a higher porosity in surface morphology but also in a rougher surface.

## 참고문헌

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