

## 다결정 3C-SiC 버퍼층위 증착된 AlN 박막의 열처리 효과

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### Effects of thermal annealing of AlN thin films deposited on polycrystalline 3C-SiC buffer layer

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**Abstract :** In this study, the effect of a long post-deposition thermal annealing(600 and 1000 °C) on the surface acoustic wave (SAW) properties of polycrystalline (poly) aluminum-nitride (AlN) thin films grown on a 3C-SiC buffer layer was investigated. The poly-AlN thin films with a (0002) preferred orientation were deposited on the substrates by using a pulsed reactive magnetron sputtering system. Experimental results show that the texture degree of AlN thin film was reduced along the increase in annealing temperature, which caused the decrease in the electromechanical coupling coefficient ( $k^2$ ). The SAW velocity also was decreased slightly by the increase in root mean square (RMS) roughness over annealing temperature. However, the residual stress in films almost was not affected by thermal annealing process due to small lattice mismatch different and similar coefficient temperature expansion (CTE) between AlN and 3C-SiC. After the AlN film annealed at 1000 °C, the insertion loss of an IDT/AlN/3C-SiC/SiO<sub>2</sub>/Si structure (-16.44 dB) was reduced by 8.79 dB in comparison with that of the as-deposited film (-25.23 dB). The improvement in the insertion loss of the film was fined according to the decrease in the grain size. The characteristics of AlN thin films were also evaluated using Fourier transform-infrared spectroscopy (FT-IR) spectra and X-ray diffraction (XRD), scanning electron microscopy (SEM), and atomic force microscopy (AFM) images.

**Key Words :** AlN, Two-port SAW resonator, Insertion loss, Surface morphology, Annealing