3C-SiC 버퍼층이 AIN 박막형 SAW 특성에 미치는 영향
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Effect of a 3C-SiC buffer layer on the SAW properties of AIN films
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Abstract: This paper describes the influence of a polycrystalline (poly) 3C-SiC buffer layer on the surface acoustic
wave (SAW) properties of poly aluminum nitride (AIN) thin films by comparing the center frequency, insertion loss, the
electromechanical coupling coefficient ($k^2$), and the temperature coefficient of frequency (TCF) of an IDT/AIN/3C-SiC
structure with those of an IDT/AIN/Si structure. The poly-AIN thin films with an (0002)-preferred orientation were
deposited on a silicon (Si) substrate using a pulsed reactive magnetron sputtering system. Results show that the insertion loss (21.92
dB) and TCF (−18 ppm°C) of the IDT/AIN/3C-SiC structure were improved by a closely matched coefficient of thermal
expansion (CTE) and small lattice mismatch (1%) between the AIN and 3C-SiC. However, a drawback is that the
$k^2$(0.79%) and SAW velocity (5020 m/s) of the AIN/3C-SiC waveguide were reduced by appearing inhomogenenous (0002) AIN planessuchas the
(10 1 2) and (10 1 3) AIN planes in the AIN/SiC film. Although disadvantages were shown to exist, the use of
the AIN/3C-SiC structure for SAW applications at high temperatures is possible. The characteristics of the AIN thin
films were also evaluated using FT-IR spectra, XRD, and AFM images.

Key Words: AIN, 3C-SiC, two-port SAW resonator, SAW properties