

3C-SiC 버퍼층이 AlN 박막형 SAW 특성에 미치는 영향

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Effect of a 3C-SiC buffer layer on the SAW properties of AlN 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 (AlN) 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/AlN/3C-SiC structure with those of an IDT/AlN/Si structure. The poly-AlN 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/AlN/3C-SiC structure were improved by a closely matched coefficient of thermal expansion (CTE) and small lattice mismatch (1%) between the AlN and 3C-SiC. However, a drawback is that the k^2 (0.79%) and SAW velocity (5020 m/s) of the AlN/3C-SiC SAW device were reduced by appearing in some non-(0002) AlN planes such as the (10 $\bar{1}$ 2) and (10 $\bar{1}$ 3) AlN planes in the AlN/SiC film. Although disadvantages were shown to exist, the use of the AlN/3C-SiC structure for SAW applications at high temperatures is possible. The characteristics of the AlN thin films were also evaluated using FT-IR spectra, XRD, and AFM images.

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