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ZnO/3C-SiC/Si(100) 다층박막구조에서의 표면탄성파 전파특성

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Surface acoustic wave (SAW) devices have become more important as mobile telecommunication systems need high-frequency, low-loss, and down-sized components. Higher-frequency SAW devices can be more easily realized by developing new high-SAW-velocity materials. The ZnO/diamond/Si multilayer structure is one of the most promising material components for GHz-band SAW filters because of its SAW velocity above 10,000 m/sec. Silicon carbide is also a potential candidate material for high frequency, high power and radiation resistive electronic devices due to its superior mechanical, thermal and electronic properties. However, high price of commercialized 6H- or 4H-SiC single crystalline wafer is an obstacle to apply SiC to high frequency SAW devices.

In this study, single crystalline 3C-SiC thin films were grown on Si (100) by MOCVD using bis-trimethylsilylmethane (BTMSM, $C_7H_{20}Si_7$) organosilicon precursor. The 3C-SiC film properties were investigated using SEM, TEM, and high resolution XRD. The FWHM of 3C-SiC (200) peak was obtained 0.37 degree. To investigate the SAW propagation characteristics of the 3C-SiC films, SAW filters were fabricated using interdigital transducer electrodes on the top of ZnO/3C-SiC/Si(100), which were used to excite surface acoustic waves. SAW velocities were calculated from the frequency-response measurements of SAW filters. A generalized SAW mode and pseudo-SAW mode were observed as well as a high velocity pseudo-SAW mode. The hard 3C-SiC thin films stiffened Si substrate so that the velocities of fundamental and the 1st mode increased up to 5,100 m/s and 9,140 m/s, respectively.