

4H-SiC 표면에서 AFM의 산화 패턴 제작

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AFM fabrication of oxide patterns on 4H-SiC surface

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Abstract : Atomic force microscopy (AFM) fabrication of oxide patterns is an attractive technique for nanoscale patterns and related device structures. SiC exhibits good performance in high-power, high-frequency, and high-temperature conditions that is comparable to the performance of Si. The AFM fabrication of oxide patterns on SiC is important for electronic applications. However, there has not been much reported investigations on oxidation of SiC using AFM. We achieved the local oxidation of 4H-SiC using the high loading force of ~100 nN, although the oxidation of SiC is generally difficult mainly due to the physical hardness and chemical inactivity. All the experiments were performed using atomic force microscopy (S.I.S. GmbH, Germany) with a Pt/Ir-coated Si tip at ~40% humidity and room temperature. The spring constant and resonance frequency of the tip were around ~3 N/m and ~70 kHz. We fabricated oxide patterns on n-type 4H-SiC ($\sim 10^{19}$ /cm³) and n-type Si ($\sim 1.9 \times 10^{16}$ /cm³). In summary, we demonstrated that the oxide patterns can be obtained over the electric field of $\sim 1 \times 10^7$ V/cm and the high loading force using the tip as a cathode. The electric field transports the oxyanions (OH⁻) to the positively biased surface.

Key Words : atomica force microscopy (AFM), Silicon Carbide, oxide pattern, loading force

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