

課題番号	: F-19-UT-0038
利用形態	: 機器利用, 技術補助
利用課題名(日本語)	: Si 基板上への窒化物半導体成長に向けた SiC バッファ層の形成メカニズム解析
Program Title (English)	: Analysis of formation mechanism of SiC buffer layer for crystal growth of nitride semiconductors on Si substrates
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1. 概要(Summary)

Nitride semiconductors have attracted much attention for the application to optical and electronic devices. Si is a preferable substrate for the epitaxial growth of III-nitrides for the low cost, large area, and mature processes. However, direct epitaxial growth of nitrides on Si is difficult because of large mismatch of characteristics such as lattice constants and thermal expansion coefficients. To solve these problems, we have proposed to utilize a 3C-SiC thin film as a buffer layer, which is formed by Si surface carbonization using CO gas based on a thermodynamic approach.

In this study, we investigated the formation mechanism of SiC thin layer by Si surface carbonization and growth conditions of GaN growth on the SiC/Si and SiC substrates.

2. 実験(Experimental)

【利用した主な装置】

ステルスダイサー, ブレードダイサー

【実験方法】

Part of Si(110) wafers were cut into 1/4 chips using a stealth dicer because of difficulty in cleavage orthogonally. The whole Si wafers and/or chips were carbonized. Carbonized Si substrates, i.e., SiC/Si substrates were cut into ~1 cm² pieces. Commercial 3- or 4-inch 4H-SiC(0001) substrates were also prepared and cut also into ~1 cm² pieces using a blade dicer. GaN with the thickness of equivalent to 1 μm was grown on the SiC/Si and SiC substrates.

3. 結果と考察(Results and Discussion)

Figure 1 shows appearance of several 1/4 chips after dicing. Si substrates were cut into 1/4 chips perfectly with smooth edges. No particles were generated on the Si surface. 4H-SiC wafers were also cut in a rectangle shape. Single crystal GaN layer with a flat surface was successfully obtained. Analysis on SiC thin film are now in investigation.



Fig. 1 Appearance of 1/4 Si chips after dicing.



Fig. 2 Appearance of SiC chip after dicing and followed by the growth of GaN.

4. その他・特記事項(Others)

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5. 論文・学会発表(Publication/Presentation)

[1] J. Wang et al., APWS2019, TuP-GR-13 (2019).

[2] Y. Zhu et al., APWS2019, ThP-GR-9 (2019).

他, 全5件.

6. 関連特許(Patent)

なし.