

課題番号 : F-21-NU-0029  
利用形態 : 機器利用  
利用課題名(日本語) : GaN マイクロ LED のための InGaN/GaN ナノディスク作製  
Program Title (English) : Fabrication of InGaN/GaN nanodisk for GaN micro-LED  
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キーワード/Keyword : GaN, neutral beam etching, micro LED, リソグラフィ・露光・描画装置

## 1. 概要(Summary)

We proposed a novel directional GaN micro-LED in which an InGaN/GaN MQW active region with a lateral dimension on the order of 100 nm is embedded at the center of a GaN truncated cone structure. In this work, fabrication of InGaN/GaN nanodisk as the active region of the above directional micro-LED was carried out employing the electron beam lithography and neutral beam etching techniques.

## 2. 実験(Experimental)

### 【利用した主な装置】

電子線露光装置

### 【実験方法】

- Fabrication of 100, 130 and 150-nanometer dot patterns
- Deposition of 100nm SiO<sub>2</sub> by plasma-enhanced chemical vapor deposition
  - Spin-coating of PMGI at 1500 rpm and baking at 190°C for 5 min, followed by spin-coating of ZEP-520A: anisole (1:1) at 3000 rpm and baking at 190°C for 5 min
  - Electron beam lithography writing with a beam current of 2 nA
  - Development with ZED-N50 rinsed by IPA for 2 min and with AZ300MIF for 10s rinsed by DI water for 10s.
  - Deposit Ni and lift-off
  - Reactive ion etching of SiO<sub>2</sub> by using the Ni patterns as the mask
  - Remove the remained Ni by a dilute aqua regia

solution

- Dry etching using neutral beam was carried out in AIST (Tsukuba) using the SiO<sub>2</sub> dot pattern as the mask.

## 3. 結果と考察(Results and Discussion)

Fig. 1 shows the scanning electron microscopy (SEM) image of an InGaN/GaN nanodisk array fabricated by using the above process. Fabrication of directional micro-LEDs incorporating the InGaN/GaN nanodisk active region is under progress.

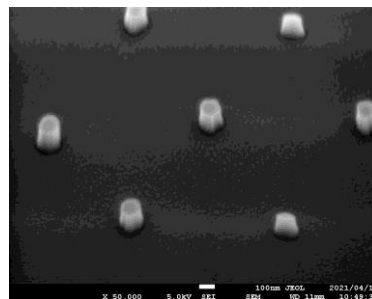


Fig. 1 Tilted SEM image of an InGaN/GaN nanodisk array fabricated in this work.

## 4. その他・特記事項(Others)

None

## 5. 論文・学会発表(Publication/Presentation)

None

## 6. 関連特許(Patent)

None