

Accepted Manuscript

Pretreatment by selective ion-implantation for epitaxial lateral overgrowth of GaN on patterned sapphire substrate

Dae-sik Kim, Woo Seop Jeong, Hyungduk Ko, Jae-Sang Lee, Dongjin Byun



PII: S0040-6090(17)30477-7
DOI: doi: [10.1016/j.tsf.2017.06.042](https://doi.org/10.1016/j.tsf.2017.06.042)
Reference: TSF 36049

To appear in: *Thin Solid Films*

Received date: 28 September 2016
Revised date: 9 June 2017
Accepted date: 21 June 2017

Please cite this article as: Dae-sik Kim, Woo Seop Jeong, Hyungduk Ko, Jae-Sang Lee, Dongjin Byun, Pretreatment by selective ion-implantation for epitaxial lateral overgrowth of GaN on patterned sapphire substrate, *Thin Solid Films* (2017), doi: [10.1016/j.tsf.2017.06.042](https://doi.org/10.1016/j.tsf.2017.06.042)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Pretreatment by selective ion-implantation for epitaxial lateral overgrowth of GaN on patterned sapphire substrate

Dae-sik Kim^a, Woo Seop Jeong^a, Hyungduk Ko^b, Jae-Sang Lee^c, Dongjin Byun^{a*}

^a Department of Materials Science & Engineering, Korea University, 145 Anam-ro, Seongbuk-gu, Seoul 02841, South Korea

^b Nanophotonics Research Center, Korea Institute of Science and Technology, 5, Hwarang-ro 14-gil, Seongbuk-gu, Seoul 02792, Korea

^c Korea Multi-purpose Accelerator Complex, Korea Atomic Energy Research Institute, 181 Mirae-ro, Geoncheon-eup, Gyeongju-si, Gyeongsangbuk-do 38180, South Korea

Epitaxial lateral overgrowth (ELO) process of gallium nitride (GaN) films on cone-shaped patterned sapphire substrates (PSS) that were pretreated by N⁺ ion-implantation was performed by using metal organic chemical vapor deposition. The planar areas of the PSS surface were covered with a 250-nm-thick silicon dioxide (SiO₂) mask to protect them from ion-implantation damages, whereas the cone-shaped patterns of the PSS were exposed to the N⁺ ions. The ion-implantation pretreatment was therefore selectively carried out on the cone-shaped pattern of PSS at 67.5 keV with a high dose of $5 \times 10^{17} \text{ cm}^{-2}$. As a result of ion-implantation pretreatment, nucleation growth of GaN poly-grains was inhibited on the cone-shaped patterns that have various crystal planes, such as c-like, R-like, n-like planes. The surface roughness and crystal quality of GaN films grown on the ion-implanted PSS were improved owing to the inhibition of nucleation growth on the patterns. The ion-implantation pretreatment is a very promising technique in ELO process of GaN on an uneven substrate such as cone-shaped PSS that includes various crystal planes.

Download English Version:

<https://daneshyari.com/en/article/8033349>

Download Persian Version:

<https://daneshyari.com/article/8033349>

[Daneshyari.com](https://daneshyari.com)