Faculty of Engineering
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Polarization Control in Photonic Devices with Subwavelength Grating

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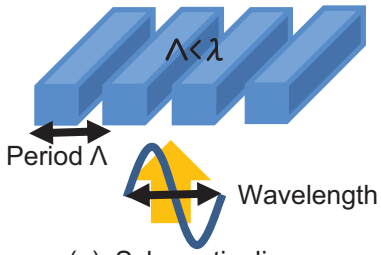

(a) Schematic diagram

(b) Periodic distribution of refractive index for light

Fig.1 Sub-wavelength grating structure

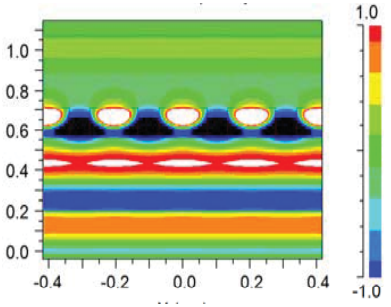

Fig.2 Electrical field distribution for TM light by FDTD theory (in case of λ/Λ=1.8)

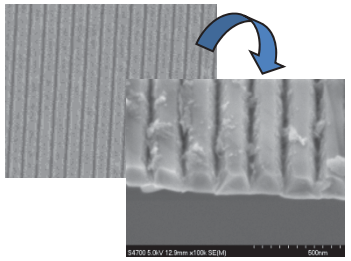

Fig.3 Fabricated sub-wavelength grating on UV-LED surface

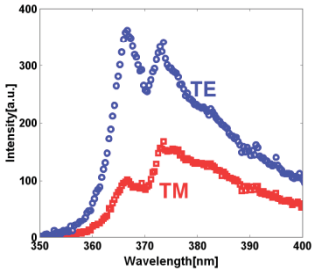

Fig.4 Emission spectra from UV-LED

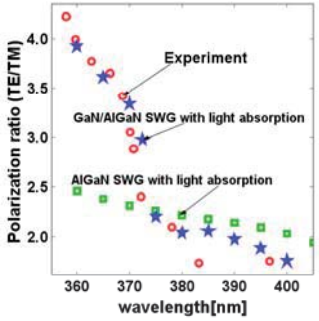

Fig.5 Polarization ratio from UV-LED with sub-wavelength grating

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Highly polarized UV emission devices were expected to develop the applications, such as high resolution imaging, high sensitive sensors, etc. The compact polarization control device with high transmittance is required in order to develop integrated device for these applications.

One of the candidates to overcome the issue is the device using high contrast dielectric subwavelength grating (SWG) structure. In SWG, the pitch of the grating is shorter than the wavelength of incident light. The Bloch like eigen-modes within SWG region resulting from the spatial periodicity of refractive index distribution interacts with incident light. As a result, the desirable optical characteristics such as broadband high reflectivity and polarization sensitivity are obtained with optimal structures.

We have investigated the polarization characteristics of AlGaN-based UV-LED with SWG fabricated on the top of LED surface, and demonstrated the feasibility of high polarized UV-LED grown on c-plane sapphire.

Keywords : photonic device, sub-wavelength grating, polarization control, nano device

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