

8th International Conference and Exhibition on

LASERS, OPTICS & PHOTONICS

November 15-17, 2017 | Las Vegas, USA

Recent progress of AlGa_N-based deep-ultraviolet light-emitting diodes

Masafumi Jo and Hideki Hirayama
RIKEN Brain Science Institute, Japan

AlGa_N deep ultraviolet light-emitting diodes (DUV-LEDs) and laser diodes (LDs) are attracting a great deal of attention, since they have the potential to be used in a wide variety of applications, such as for sterilization, water purification, UV curing and in the Medical and Biochemistry fields and so on. As a result of recent developments in AlGa_N DUV LEDs, high internal quantum efficiencies (IQE) of more than 60-70% have been achieved by reducing the threading dislocation density (TDD) of the AlN, by improving the crystal growth technique and/or by the introduction of AlN single crystal wafers. However, the wall-plug efficiency (WPE) of AlGa_N DUV-LEDs still remains at several percent. The first target for the efficiency of AlGa_N DUV-LEDs is to go beyond an efficiency of 20%, which would make them comparable to mercury lamps. In this work, we demonstrate an external quantum efficiency (EQE) of over 20% in an AlGa_N DUV-LED by a significant improvement of light extraction efficiency (LEE). In order to increase LEE of DUV LEDs, we introduced a transparent p-AlGa_N contact layer, a highly reflective p-type electrode and AlN template buffer fabricated on patterned sapphire substrate (PSS). By introducing transparent p-AlGa_N contact layer and reflective electrode, LEE was enhanced by approximately 3 times. We also tried to increase wall plug efficiency (WPE) by reducing the applying voltage that was increased by increasing p-AlGa_N contact resistance. By optimizing p-AlGa_N layer structures, we have succeeded in reducing the operating voltage of DUV LED and obtained record WPE of 9.6%.

Biography

Masafumi Jo has received his PhD from the University of Tokyo in 2003. He is the Researcher of Quantum Optodevice Laboratory at RIKEN. He has worked on fabricating nano-structured solid-state light sources.

masafumi.jo@riken.jp

Notes: