

8th International Conference and Exhibition on

LASERS, OPTICS & PHOTONICS

November 15-17, 2017 | Las Vegas, USA

High quality nitride materials (AlN and AlGaN) on Si and sapphire substrates and UV-LED applications

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The growth of thick, high quality and low-stress AlN films on Si and Al₂O₃ substrates is highly desired for a number of applications like the development of micro and nanoelectromechanical system (MEMS and NEMS) technologies and particularly for fabricating AlGaN based UV-LEDs. UV-LEDs are attractive as they are applied in many areas, such as air and water sterilization, efficient white lighting, high-density optical data storage and military applications such as biological agent detection and non-line-of-sight communication. However, the development of UV-LEDs on Si substrates is highly desired for a series of reasons like the availability of cheap, large-diameter silicon wafers, the much lower device processing costs, and the possibility of monolithical integration of the UV-LEDs with Si circuitry. In addition, efficient AlGaN based deep UV-LEDs require layers and substrates which are transparent in UV light. So, it is preferable to grow the AlGaN based deep UV-LEDs active layers on Si substrates as the Si can be removed by chemical treatment to allow back illumination and avoid the generation and reabsorption of UV light by backside emission. These advantages make silicon an attractive substrate for AlGaN based UV devices. Additionally high quality AlN template on Al₂O₃ substrate still is the key layer to grow high quality AlN and high Al content AlGaN materials for DUV applications since AlN substrate price and size are not suitable for mass production.

Biography

Ilkay Demir has completed his PhD at the age of 32 years from Cumhuriyet University, Physics Department. He is the researcher of Nanophotonics Research and Application Center and Department of Nanotechnology Engineering. He spent 1 year of his PhD at Center for Quantum Devices under supervision of Prof. Manijeh Razeghi. He has published 5 papers in reputed journals.

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