



Fluorescent silicon carbide for white light source

Ou, Haiyan; Wei, Yi; Lin, Li; Tarekegne, Abebe Tilahun; Lu, Weifang; Ou, Yiyu; Herstrøm, Berit; Jensen, Flemming; Liang, Meng; Liu, Zhiqiang

Publication date:
2019

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):

Ou, H., Wei, Y., Lin, L., Tarekegne, A. T., Lu, W., Ou, Y., ... Wellmann, P. (2019). *Fluorescent silicon carbide for white light source*. Abstract from 2019 Spring Meeting of the European Materials Research Society , Nice, France.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Fluorescent silicon carbide for white light source

Haiyan Ou 1, Yi Wei 1, Li Lin 1, Abebe Tilahun Tarekegne 1, Weifang Lu 1, Yiyu Ou 1, Berit Herstrøm 2, Flemming Jensen 2, Meng Liang 3, Zhiqiang Liu 3, Xiaoyan Yi 3, Valdas Jakubavicius 4, Mikael Syväjävi 4, Philipp Schuh 5, Peter Wellmann 5

- 1) Department of Photonics Engineering, Technical University of Denmark, Ørsteds Plads 345A, Kongens Lyngby DK-2800, Denmark
- 2) DTU Danchip, Technical University of Denmark, Ørsteds Plads 347, Kongens Lyngby DK-2800, Denmark
- 3) Semiconductor Lighting R&D Center, Institute of semiconductors, CAS, No.A35, QingHua East Road, Haidian District, Beijing, PR China
- 4) Department of Physics, Chemistry and Biology, Linköping University, SE-58183 Linköping, Sweden
- 5) Materials of Electronics and Energy Technology, University of Erlangen-Nuremberg, 91058 Erlangen, Germany

The technology breakthrough in high-efficiency blue nitride based LEDs has enabled the rapid market penetration of energy-saving LED white light sources. In this presentation, silicon carbide (SiC) has been explored to emit yellow light and blue light as a new wavelength conversion material for a new type of white LED light source taking advantages of abundance and good thermal conductivity of SiC. Strong yellow emission from boron and nitrogen co-doped SiC has been demonstrated at room temperature. Blue emission has been investigated from both aluminum and nitrogen co-doping of SiC and porous SiC. Strong blue emission from Al-N co-doped SiC has only been observed at low temperature, while strong blue emission from porous SiC has been achieved at room temperature after optimization of pores formation conditions and surface passivation. White light with color rendering index as high as 81 has been achieved from B-N co-doped SiC with a porous surface under optical pump. A prototype of hybridly integrated warm white is achieved by adhesive bonding of a blue LED on SiC substrate with B-N co-doped fluorescent SiC. At last, a monolithically integrated warm white light source through directly growing near ultraviolet LED on fluorescent SiC by metalorganic vapor chemical vapor deposition is demonstrated. Our original results cover growth of fluorescent SiC, formation of porous SiC, optical characterization of these materials with regard to photoluminescence, low temperature photoluminescence, time resolved photoluminescence and thermally stimulated luminescence, material emission mechanism analysis, carrier dynamics analysis, warm white light source fabrication and characterization. Basing on these results, perspectives are shared.