InGaN platelets for red micro LEDs

Magnus Heurlin[1], Martin Berg[1], Heera Menon[1], Ibrahim Yilmaz[1], Zhaoxia Bi[1,2], Lars Samuelson[1,3,4], Mikael Björk[1]

[1] Hexagem AB, Lund, Sweden, [2] Future Display Institute of Xiamen, 361005 Xiamen, China, [3] Institute of Nanoscience and Applications, Southern University of Science and Technology, 518055 Shenzhen, China, [4] NanoLund, Lund University, Box 118, 22100 Lund, Sweden

The development of the next generation self-emissive displays is focusing on using the compound semiconductors GaN, InGaN and AlGaInP to produce pixels emitting in blue, green and red. LED technology based on these materials offer several advantages over for instance OLEDs, however both technologies have challenges in shrinking the dimensions to attain high-resolution displays without compromising efficiency or colour purity. For applications such as augmented/mixed reality devices, LED pixel sizes below 5 μm are desired. However, achieving such small sizes, particularly with AlGaInP for red LEDs, proves daunting due to efficiency loss stemming from increased relative surface area. [1]

Addressing this challenge, Hexagem is pioneering a unique technology centred on sub-micrometre sized all-InGaN platelets. These platelets offer a tuneable In composition ranging from 0-20%. This reduces the strain in the active quantum well (QW) layers and allows us to emit light in the blue, green, and red part of the spectrum. [2] In this work, we present our ongoing development effort concerning the electrical, optical, and structural properties of sub-μm red LEDs, pivotal for establishing their commercial viability in future display technology.

[1] Chien-Chung Lin et al 2023 J. Phys. Photonics 5 042502

[2] Zhaoxia Bi et al 2023 Chinese Phys. B 32 018103