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InGaN/GaN quantum wells: correlations between cathodoluminescence properties and V pit characteristics

InGaN/GaN quantum well (QW) structures are commonly used in LEDs and laser applications [1]. Under certain growth conditions, hexagonal V shaped pits (V pits) are formed. These V pits may enlarge during the growth and their density is connected with density of dislocations containing a screw component. These V pits have large impact on optical properties of the samples [2]. Therefore, statistical quantities concerning V pits (like density, sizes, ...) are of great importance. If they are obtained, they can be correlated with luminescence properties of the sample and provide deeper insight into physics of InGaN/GaN quantum well structures.

Scanning electron microscope (SEM) is standard equipment for studying surface defects of different samples. In the case of InGaN/GaN, a common type of defects are V pits. To obtain relationship between the V pit density, sizes, etc. and properties of the samples, automatic V pit finding in the SE image is required. Automatic finding of V pits by blob detection as well as automatic fitting of cathodoluminescence (CL) spectra is carried out by CV2 library for Python. This contribution shows correlations between CL properties and V pit statistical quantities as the motivation for using Python in the image analysis.

[1] S. Nakamura et al., Appl. Phys. Lett. 62 (1993) 2390.

[2] T. Vaněk et al., J. Cryst. Growth. 565 (2021) 126151.

Primary author: HÁJEK, František

Co-authors: HOSPODKOVÁ, Alice (FZÚ AVČR, v.v.i., Cukrovarnická 10, Praha 6); Dr HUBÁČEK, Tomáš (Institute of Physics, CAS); Dr OSWALD, Jiří (Institute of Physics, CAS); Dr DOMINEC, Filip (Institute of Physics, CAS); Mr BATYSTA, Jan (Institute of Physics, CAS); Mr VANĚK, Tomáš (Institute of Physics, CAS); Dr PANGRÁC, Jiří (Institute of Physics, CAS)

Presenter: HÁJEK, František

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