# Modeling of Nitride Nanostructure Based Classical and Non-Classical Light Emitters

Nenad Vukmirović[1], Stanko Tomić[2] and Žarko Gačević[3]
[1]*Scientific Computing Laboratory, Institute of Physics Belgrade, Serbia*
[2]*Joule Physics Laboratory, University of Salford, Manchester, United Kingdom*
[3]*ISOM - ETSIT, Universidad Politécnica de Madrid, Spain*
email: nenad.vukmirovic@ipb.ac.rs

Nanostructures based on III-nitride semiconductors offer certain advantages for realization of single-photon sources. Larger band offsets and effective masses lead to strong quantum-confinement effects which enable the operation of single-photon sources at higher temperatures. Wide band gap of III-nitrides leads to the emission in the blue and ultraviolet spectral range, which is not accessible with most of the other materials. In this talk, simulation insights into the classical and non-classical light emission properties of III-nitride nanostructures will be discussed.

In the first part of the talk, calculations of excitonic and biexcitonic states in self-assembled GaN/AlN quantum dots will be presented with special emphasis on the use of these dots for single-photon source applications [1]. Theoretical methodology for the calculation of single-particle states was based on 8-band strain-dependent envelope function Hamiltonian, with the effects of spin-orbit interaction, crystal-field splitting, and piezoelectric and spontaneous polarizations taken into account. Exciton and biexciton states were found using the configuration-interaction method. Optimal dot heights for their use in single-photon emitters were determined for various diameter-to-height ratios.

In the second part of the talk, electronic properties of InGaN quantum structures embedded in site controlled GaN nanowires will be presented [2]. The InGaN structures under consideration consist of two sections: the middle one, which is formed on the polar *c*-facet, and the side one, which is formed on the semi-polar *r*-facets. These structures exhibit two-color emission at 384 nm and 488 nm. We identify that the main origin of two-color emission is higher In incorporation on the nanowire polar *c*-facet, while the influences of internal electric field and strain are less significant.

REFERENCES

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