Reviews on Advanced Materials and Technologies, 2025, vol. 7, no. 2, pp. 124–140
DOI: 10.17586/2687-0568-2025-7-2-124-140

Influence of the Elastic Field of Quantum Dots on the Electronic Band Structure of III-Nitride Wire Semiconductors

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Abstract. In this work, we investigate the effect of the strains induced by axially symmetric quantum dots of cylindrical, hemispherical and conical shapes in a III-nitride semiconductor nanowire on the band structure of the nanowire material. To study the elastic properties of quantum dots, a model of an elastic inclusion with eigenstrain has been used. To consider the influence of the free surface of the wire on the elastic fields of quantum dots, the corresponding boundary value problems have been solved analytically. The **k**·**p** perturbation method has been applied to analyze the strain induced effect on the energy band structure of the material. The results obtained demonstrate that the band gap width clearly depends on the shape of the embedded quantum dot. The effect of quantum dot strains on the electropolarization of the material possessing ferroelectric properties, was investigated. It was shown that the largest jump in electric charge density is achieved near the apex of the conical inclusion.

Acknowledgements. This work was supported by the Ministry of Science and Higher Education of the Russian Federation, project no. FSER-2025-0005.

Citation: Rev. Adv. Mater. Technol., 2025, vol. 7, no. 2, pp. 124–140

View online: https://doi.org/10.17586/2687-0568-2025-7-2-124-140

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