

INVITATION

Department of Condensed Matter Physics

Is pleased to invite you to the lecture

Novel epitaxial III-V quantum dot materials
for specific photonic applications

by

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Date: 26 November 2025

Time: 11:00

Venue: Lecture room F1, Building 6, Faculty of Science, Kotlářská 2, Brno

Although there are many mature systems of epitaxial quantum dots (QDs) made of III-V semiconductors and a lot of examples of their device applications, the still growing demands of improved performances or appearance of new applications drive a continuous development of QD technologies. This lecture will concern a summary of our recent collaborative work on three novel QD systems designed and investigated with respect to a specific photonic application. The first one are self-assembled InGaAs/GaAs QDs grown at the very limit of the Stranski-Krastanov mode in a modified MOCVD process combined with post-growth annealing to push their emission range beyond the state-of-the-art, i.e. towards 935-955 nm wavelengths at room temperature. Their intrinsic property of broad gain function can be then utilized in the active region of tunable VCSELs or multiwavelength VCSEL arrays suitable for real-time spectroscopic water vapor sensing system crucial in many industrial and environmental applications. The second group of dots concerns nanostructures made of In(As)P and grown monolithically via selective area epitaxy in pyramidal openings patterned directly in silicon substrate. It allows to obtain a low density matrix of single quantum QDs with bright emission in the telecommunication bands which makes them perspective for cost- and resource-effective optical quantum information processing systems compatible with electronic circuits. Eventually, there will be discussed the properties of InAsP QDs in InP nanowires fabricated by employing Au-assisted vapor liquid solid growth in a chemical beam epitaxy in a pure zincblende crystallographic structure (in contrast to commonly investigated wurtzite nanowires, which are limited to very small diameters due to defect formation). The zincblende dots in nanowires are developed in order to control their emission in a broad range of near infrared and at the same time tailor the nanowire geometry for efficient light outcoupling for sources of single photons or more complex photonic states for applications in quantum communication schemes and photonic quantum computing.

This lecture was supported by the project QM4ST (Quantum materials for applications in sustainable technology), reg. no. CZ.02.01.01/00/22_008/0004572, cofunded by the ERDF from the Programme Johannes Amos Comenius, call Excellent Research.



Co-funded by
the European Union