The Metalorganic Vapour Phase Epitaxy Growth of $A^{III}B^{V}$ Heterostructures Observed by Reflection Anisotropy Spectroscopy

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Reflection anisotropy spectroscopy (RAS) is a very useful technique that is used across different scientific fields like physics [1] or biology [2]. As for the MOVPE technological method, it enables an in-situ observation of a structure growth. The principle of the method is based on different reflectivity of a linearly polarized beam from the surface in two perpendicular crystallographic directions, thus it is possible to distinguish different surface reconstructions that are typical for varying materials or progress of the growth. By this method we are able to predict whether the structure growth was successful or not according to the preparation plan. Because this tool is universal, we will present various results and observations: a monolayer (ML) growth of GaAs, evaluation of the speed of growth, In and Sb atoms surfacting behaviour, precise moment of In and Sb atoms incorporation in the structure, quantum dot (QD) formation and estimation of time and proper amount of material to prepare QDs. RAS together with other measuring techniques such as AFM, HRTEM or photoluminescence (PL) help to better understand the processes that take place during the growth. We will also mention advantages and disadvantages of RAS which will hopefully help to provide a complex view on this indispensable method.

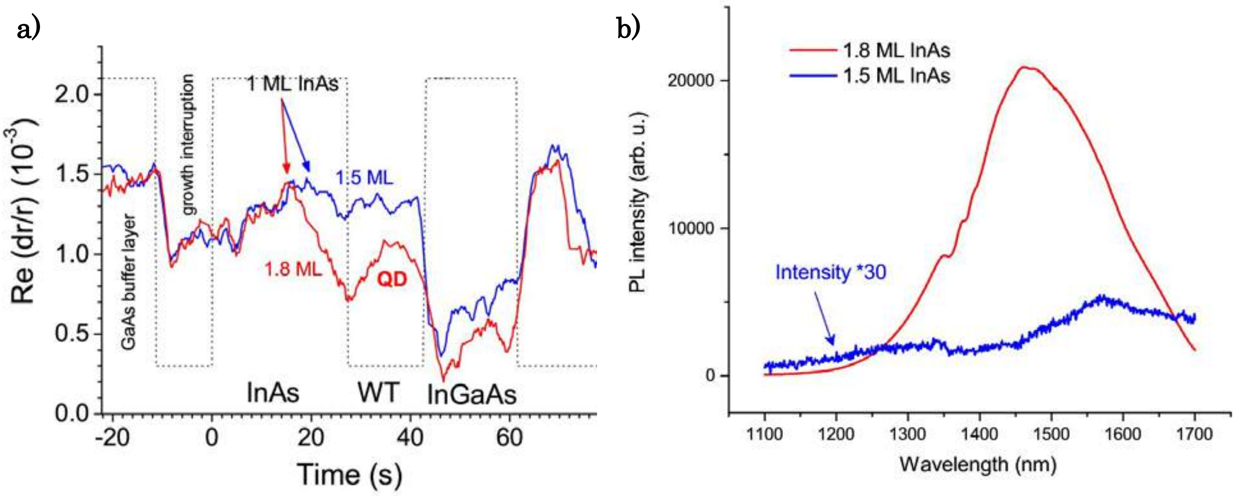

Fig. 1: a) The optimal amount of InAs for a QD formation is between 1.8 and 2.1 ML, the estimated amounts from RAS are 1.5 ML for the blue line (no QDs should be formed) and 1.8 ML for the red line (QD are formed according to the typical increase during the waiting time). **b)** PL measurement proves that for 1.8 ML the QDs were formed and emit around 1500 nm, for 1.5 ML no QDs were formed (only PL noise was detected).

[1] A. Hospodková, J. Pangrác, J. Vyskočil, M. Zíková, J. Oswald, Ph. Komninou, and E. Hulicius, *J. Cryst. Growth* **414**, 156 (2015).
[2] A. L. Schofield, C. I. Smith, V. R. Kearns, D. S. Martin, T. Farrell, P. Weightman, and R. L. Williams, *J. Phys. D: Appl. Phys.* **44**, 335302 (2011).