The study of abruptness of the ZnO/MgO layers interfaces and excitonic emission of the ZnO/MgO superlattices on a-plane ZnO substrates grown by MBE

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ZnO has received a subsequent rapid expansion of interest in recent years, as it is a very versatile and promising material. Due to its structural and opto-electrical properties it is seen as a wideband semiconductor fit for a variety of applications such as near-UV emitter and sensor. There is a lot of work concerning ZnO/ZnMgO quantum structures (QS) grown on differently oriented substrates of silicon and sapphire. The usage of these introduce a problem of large lattice mismatch between ZnO QS and the substrates, which has to be solved to produce good quality structures retaining wurtzite 2D planar structures with abrupt ZnO/ZnMgO interfaces. The ZnO substrates allows to minimalize the problematic lattice mismatch and introduced additional strains for fabrication of the high quality ZnO/ZnMgO quantum structures.

In this work the analysis of homoepitaxialy grown ZnO/MgO superlattices on m-oriented ZnO substrates is described. The influence of different phases of ZnO and MgO on interface's abruptness is studied in details. We found that the wutrzite coordination is retained in the MgO thin barriers up to 2 nm but some diffusion of Mg from barriers to ZnO WQ's was inevitable. This can be explained by the difference of vapor pressure between Mg and Zn elements at growth temperatures and high mobility of Mg atoms which are gladly incorporate into ZnO matrix. As a result a subtle (the size of one monolayer) ZnMgO film is created at the interfaces which is partly responsible for retaining the wutrzite structure of completely strained MgO layers.

Acknowledgements. The work was supported by the NCN project DEC-2018/28/C/ST3/00285