

Abstract

In this work the preparation and investigation of semiconductor microcavities is presented. The performed investigations are focused on optimizing the Molecular Beam Epitaxy growth of Distributed Bragg Reflectors and self-assembled grown InAs quantum dots.

Basic processes during Molecular Beam Epitaxy growth, the results of spectroscopic measurements and simulations performed on a computer, are the tools which were used to improve the preparation of microcavities. During this process, it became obvious that the calibration of the longtime flux rate with Reflection High Energy Electron Diffraction cannot be performed with a sufficient accuracy. For this reason, a pyrometer was installed in the Molecular Beam Epitaxy. By using this technique, a significant improvement in determining the longtime flux rates was achieved. Furthermore, an *in-situ* monitoring of the growth process can be performed.

In the same time we tried to improve the Molecular Beam Epitaxy growth of InAs quantum dots with respect to their optical properties. The early stages of the three-dimensional island growth mode as well as the dependence of the optical properties on growth conditions were investigated. From these results the size distribution of the self-assembled grown InAs quantum dots and the quantum efficiency could be significantly improved.

By combining the experiences obtained by the investigations on the Molecular Beam Epitaxy growth of Distributed Bragg Reflectors and self-assembled InAs quantum dots, another microcavity was fabricated. In the active layer of this resonator InAs quantum dots were embedded. The flux rates of the effusion cells were determined by pyrometric interferometry and the pyrometer was used for monitoring the growth process, too. Photoluminescence, transmission and reflection experiments were performed on this sample.