Growth and photoluminescence study of cadmium telluride nanowires in various structural configurations

PhD thesis abstract

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In my PhD thesis I have focused on properties of CdTe nanowires grown by molecular beam epitaxy. I begin with introducing the context of the research and a short description of basic properties of cadmium telluride. Next, in five chapters, I describe a series of experiments, composing a well thought whole, allowing to follow the development of the research topic. Additionally, in the final part I describe a theoretical model which was used to analyze the observed magneto-optical effects.

The experimental section starts with first growth of short CdTe insertions in ZnTe nanowires. Thanks to these results, we were able to find optimal growth conditions for axial growth of CdTe insertion as well as to investigate optical properties of said insertions.

Next, I present first CdTe/(Cd,Mg)Te zinc blende nanowires grown by VLS method in a system for molecular beam epitaxy, achieved by increasing the length of previously mentioned insertion. High optical quality of the nanowires is presented there, along with description of the impact of shell parameters on optical properties.

Following this part, zinc blende (Cd,Mn)Te/(Cd,Mg)Te nanowires containing a small concentration of magnetic Mn-ions are presented. The addition of manganese ions allows us to study the valence band by the means of photoluminescence in magnetic field. Those measurements, compared to calculations, performed in the frame of Luttinger-Kohn model allow us to demonstrate a light hole ground state of the emission.

In the next part I present a complete description of CdTe/(Cd,Mg)Te and (Cd,Mn)Te/(Cd,Mg)Te wurtzite nanowires. They are studied in a way similar to those in zinc blende structure and, since their composition is similar, they are also compared with each other. This fact gives us a unique opportunity to point out several differences between those two structures.

Finally, I describe an attempt on the growth of CdTe quantum wires by the means of *in-situ* annealing of as grown nanowires. I describe some interesting properties of those structures, which are different from those described in previous parts, specifically a blueshift of the emission and interesting change of the ground state character from light to heavy hole as a function of emission energy.

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