

Univerzita Karlova v Praze
Matematicko-fyzikální fakulta

ZÁZNAM O PRŮBĚHU OBHAJOBY DISERTAČNÍ PRÁCE

Název práce: Křemíkové nanokrystaly, fotonické struktury a optický zisk
(Silicon nanocrystals, photonic structures and optical gain)

Jazyk práce: angličtina

Jméno studenta/studentky: Mgr. Lukáš Ondič

Studijní program: Fyzika

Studijní obor: 4F6 Kvantová optika a optoelektronika

Školitel: RNDr. Kateřina Herynková, Ph.D.

Oponenti: Prof. J-S. Lauret, ENS-Cachan, Orsay, Francie
Ing. J. Oswald, Ph.D., fyzikální ústav AVČR, Praha

Členové komise: Prof. RNDr. J. Plášek, Ph.D., Fac. Math. Phys, Charles University, **přítomen**
Prof. Dr. B. Hönerlage, Université de Strasbourg, **přítomen**
RNDr. K. Herynková, Ph.D., Inst. Physics, Acad. Sci. Czech Republic, **přítomna**
Prof. J-S. Lauret, ENS-Cachan, Orsay, **přítomen**
Ing. J. Oswald, Ph.D., Inst. Physics, Acad. Sci. Czech Republic **přítomen**
Dr. P. Gilliot, Institut de Physique et Chimie des Matériaux de Strasbourg, **přítomen**
Prof. T. Heiser, Université de Strasbourg – Laboratoire ICUBE/CNRS, **přítomen**
Doc. RNDr. P. Němec, Ph.D., Fac. Math. Phys, Charles University, **přítomen**

Datum obhajoby: 14. 2. 2014

Průběh obhajoby:

The chair invited both the French and Czech supervisor to evaluate the performance of the candidate during the period of doctoral studies, and to summarize his main achievements. Then the candidate presented in excellent way the main results of his work using a power point presentation. After this presentation Prof. Plášek invited the reviewers to present their reviews – first prof. Lauret, second Dr. Oswald.

In the closed session, the joint jury of the thesis presented by Lukáš Ondič has acknowledged that all requirements for awarding the Ph.D. title were amply fulfilled. The jury was impressed by the height of view of the candidate and his excellent presentation of the research that he performed. The thesis is composed of balanced experimental and theoretical parts. During the scientific discussion Lukáš Ondič has fully replied to all questions and explained difficult issues in a clear and comprehensible way. The jury also appreciated the high number of publications by L. Ondič, which appeared in international journals with high scientific reputation. In conclusion, the jury is deeply convinced that Lukáš Ondič is a personality able to perform individual independent scientific work of high quality and to communicate his results in a pedagogical way. Finally, a secret ballot was done.

Počet publikací: 12 v časopisech s IF, 10 příspěvků na konferencích

Výsledek hlasování:

Počet členů s právem hlasovacím: 8

Počet přítomných členů: 8

Odevzdáno hlasů kladných: 8

Odevzdáno hlasů neplatných: 0

Odevzdáno hlasů záporných: 0

Výsledek obhajoby: prospěl/a neprospěl/a

Předseda nebo místopředseda komise: Prof. RNDr. Jaromír Plášek, CSc.

Příloha: Detailní popis obhajoby

Thesis Defence Report on the defence of the thesis by RNDr. Lukáš Ondič,

titled *Silicon nanocrystals, photonic structures and optical gain* (in Czech, Křemíkové nanokrystaly, fotonické struktury a optický zisk),

which was held in the presence of the Université de Strasbourg - Charles University Joint Jury at 9.30 a.m. on February 14, 2014 at the Faculty of Mathematics and Physics of the Charles University, in the room no. M252 at the location Ke Karlovu 3, 121 16 Prague.

The work for this thesis was done within the framework of the joint doctoral studies "en cotutelle" at Charles University in Prague (Faculty of Mathematics and Physics) and the Université de Strasbourg (Department of Physics and Chemistry of Materials). The Joint supervision agreement was signed on 28 August 2010. Following this agreement, the thesis has been written in English, and the defence was also conducted in English. The Dean of the Faculty of Mathematics and Physics of Charles University in Prague and the president of Université de Strasbourg appointed a joint ad hoc Jury for this defence.

Session Attendance

The candidate:

RNDr. Lukáš Ondič

Jury:

Prof. RNDr. J. Plášek, Ph.D., Fac. Math. Phys, Charles University, chairman

Prof. Dr. B. Hönerlage, Université de Strasbourg, supervisor

RNDr. K. Herynková, Ph.D., Inst. Physics, Acad. Sci. Czech Republic, supervisor

Prof. J-S. Lauret, ENS-Cachan, Orsay, reviewer

Ing. J. Oswald, Ph.D., Inst. Physics, Acad. Sci. Czech Republic, reviewer

Dr. P. Gilliot, Institut de Physique et Chimie des Matériaux de Strasbourg, jury member

Prof. T. Heiser, Université de Strasbourg – Laboratoire ICUBE/CNRS, jury member

Doc. RNDr. P. Němec, Ph.D., Fac. Math. Phys, Charles University, jury member

Guests:

O. Cibulka, K. Kůsová, I. Pelant, B. Rezek

Course of the Defence:

Prof. J. Plášek, the chair of the jury, began the session welcoming everybody and then introduced the jury members and the candidate to the audience. He informed the jury that all legal requirements concerning the defence of doctoral thesis, as defined by both the Czech Republic Act No. 111/98 and the internal regulations of the Faculty of Mathematics and Physics, have been met. This means that 1) the applicant submitted a dissertation titled “Silicon nanocrystals, photonic structures and optical gain, 2) CV, and 3) the list of publications. Furthermore, date of the defence was published one month in advance. The thesis was made accessible for public for one month, but neither comments nor objections against its defence arrived in due time.

The chair invited both the French and Czech supervisor to evaluate the performance of the candidate during the period of doctoral studies, and to summarize his main achievements. Then the candidate presented in excellent way the main results of his work using a power point presentation.

After this presentation Prof. Plášek invited the reviewers to present their reviews – first prof. Lauret, second Dr. Oswald. Dr. Oswald raised in his review a few questions concerning i) the process of photoelectron thermalization in Si nanocrystals, ii) the influence of sample properties (homogeneity and shape) on the optical gain measurements, and iii) the perspectives of producing devices combining photonic crystals with silicon nanoparticles and the possibility of electroluminescence in such structures. The candidate answered successfully all these questions. Then Prof Lauret, who did not attached explicit questions to his review as it is the common practice in France, asked i) about the doping of the Si nanocrystals, ii) for a detailed discussion of the simultaneous occurrence of F and S emission bands in silicon nanoparticles , iii) for comments on the existence /non-existence of calculations of oscillator strengths of F and S bands, and iv) for an explanation of the nanoparticles size-distribution on the measurement of luminescence spectra with respect to the emission spectra of individual nanocrystals . The candidate answered also these questions successfully. The chair asked the reviewers about their opinions concerning the candidate’s responses. After learning that the reviewers have been satisfied, he opened a general discussion.

Prof. Heiser asked for a comparison of the properties of photonic crystals and structures with randomly rough surface in terms of photovoltaics. Prof. Němec was interested in the design and production of photonic crystals, and about possible methods of producing Si nanocrystals with a narrower size distribution. Dr. Gilliot asked about the effect of different ways of silicon nanocrystal surface passivation, and suggested a specific type of photonic structures with circular symmetry. Prof. Heiser asked about the competitive processes between F and S bands in different samples containing silicon nanocrystals, and about the specific consequences of the final size distribution of the nanocrystals. The general discussion was ended with questions from prof. Hönerlage (about the phonon spectrum of silicon nanocrystals) and prof. Plášek (about the size of the sample surface covered by the photonic structure).

Then the chair ended the open public part of the session. The candidate and other persons who are not members of the jury were asked by the chair to leave the meeting room.

In the closed session, the joint jury of the thesis presented by Lukáš Ondič has acknowledged that all requirements for awarding the Ph.D. title were amply fulfilled. The jury was impressed by the height of view of the candidate and his excellent presentation of the research that he performed. The thesis is composed of balanced experimental and theoretical parts. During the scientific discussion Lukáš Ondič has fully replied to all questions and explained difficult issues in a clear and comprehensible way. The jury also appreciated the high number of publications by L. Ondič, which appeared in international journals with high scientific reputation. In conclusion, the jury is deeply convinced that Lukáš Ondič is a personality able to perform individual independent scientific work of high quality and to communicate his results in a pedagogical way. Finally, a secret ballot was done, in which eight jury members having the right to vote participated with following result: 8 votes in favour of awarding Mr. Ondič with Ph.D. degree, none vote against, and none invalid vote.

Finally, the chair announced the results of the secret ballot and informed the candidate that the jury representing the Board of doctoral program 4F6 Quantum Optics and Optoelectronics at the Faculty of Mathematics and Physics in Prague and the Board of representatives from the Université de Strasbourg decided to award Mr. Ondič the title Ph.D., from both the Charles University in Prague and the Université de Strasbourg.