Posudek práce

(Review of the thesis)

předložené na Matematicko-fyzikální fakultě
Univerzity Karlovy v Praze
(submitted at the Faculty of Mathematics and Physisc of Charles University in Prague)

❑ posudek vedoucího x posudek oponenta
❑ bakalářské práce ❑ diplomové práce

Autor/ka (Author): Bc. Jakub Zázvorka
Název práce (name of the thesis): Centra rekombinace v semiizolačním CdTe (Recombination centers in semiinsulating CdTe)

Studijní program a obor (Study program and branch): Optika a optoelektronika
Rok odevzdání (year of submission): 2012

Jméno a tituly ~~vedoucího~~/oponenta (Name of the reviewer): Prof. Dr. Michael Fiederle
Pracoviště (Deapartement): Freiburger Materialforschungszentrum, University of Freiburg, Germany
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Odborná úroveň práce (Professional level of the thesis):
☑ vynikající (excellent) ❑ velmi dobrá (very good) ❑ průměrná (average) ❑ podprůměrná (below average) ❑ nevyhovující (unsatisfactory)

Věcné chyby (Errors):
☑ téměř žádné (negligible) ❑ vzhledem k rozsahu přiměřený počet (corresponding to to the length of the thesis) ❑ méně podstatné četné (many, but of lower importance) ❑ závažné (serious)

Výsledky (Results):
☑ originální (original) ❑ původní i převzaté (both original and copied) ❑ netriviální kompilace (nontrivial compilation) ❑ citované z literatury (cited from literature) ❑ opsané (copied)

Rozsah práce (Size of the thesis):
❑ veliký (large) ☑ standardní (standard) ❑ dostatečný (adequate) ❑ nedostatečný (not adequate)

Grafická, jazyková a formální úroveň (graphical, language and formal level):
☑ vynikající (excellent) ❑ velmi dobrá (very good) ❑ průměrná (average) ❑ podprůměrná (below average) ❑ nevyhovující (not adequate)
Tiskové chyby (print errors):

☐ téměř žádné (nearly none) ☑ vzhledem k rozsahu a tématu přiměřený počet (corresponding to to the length of the thesis) ☐ četné (frequent)

Celková úroveň práce (overal level of the thesis):
☑ vynikající (excellent) ☐ velmi dobrá (very good) ☐ průměrná (average) ☐ podprůměrná (below average) ☐ nevyhovující (not adequate)

Slovní vyjádření, komentáře a připomínky vedoucího/oponenta (Comments of the reviewer)

The thesis is oriented on an actual topic of development of high energy X-ray and gamma ray CdTe and CdZnTe detectors. Detector technology based on semiconductor materials which can operate at room temperature is a strategically important area of interest in the field of international research and industrial applications for radiation detection. Despite a long-term reserarch and emerging applications there are many material issues which need to be adressed.
The thesis consist of 70 pages. In the first two parts (Introduction and Theory) the author describes the motivation, state-of the-art and and theoretical fundamentals of the problems on which the results of the thesis are focused. The third part (Experimental) briefly describes the used experimental setups.
The core of the work is concentrated in the fourth part (Results). At first the author in detail describes measurement of contactless resistivity on semiinsulating CdTe samples focused on understanding of the methodology used for evaluation of resistivity from time-dependent charge measurements. Several theoretical models are deeply discussed and and finally an explanation of the results based on formation of depleted surface layer is presented.
The following parts of the chapter contain a number of measurements of contactless resistivity, photoconductivity and photoluminescence. The author presents correlation analysis of the data supporting the model of the theory of the Fermi level shift relative to a midgap deep level.
The thesis is well organized and clearly written. It contains important new information, which is adequately treated and analyzed. It is an excellent step towards contactless characterization of high resistivity semiconductor materials.
The presented text fulfills to my opinion the demands placed on master thesis. Therefore I recommend it to the defense. I have the following questions and comments.

Případné otázky při obhajobě a náměty do diskuze (Qustions and comments for the defense)

1. The photoconductivity is traditionally measured with contacted samples. If you compare your result with published results for samples with contacts are the different? Why are they different – influence of surface preparation and contacts?
2. What are the reasons for the anti-correlating behaviour observed for the photoluminescence measurements?
3. The VGF method have been used for the growth of the used samples. Can you correlated the results of the CoReMa and the photoconductivity with typical conditions of the growth method VGF? Are they typical impurities or defects caused by VGF
4. What would be you exspectations for THM grown CdTe e.g. Acrorad crystals?
5. The contactlesss methods are a very important advantage. It reduces the preparation process and the influence of additional impurties is small. However, the surface has to be prepared for CoReMa, what is need for the surface preparation? How are the measurements of resistivity influenced by the preparation?

6. The plots of the photoconducitivity show a fluctuation of the measured signal, how can the stability of the measurements be improved?
7. The photoconducitivity is correlated with the charge collection of the material, based on the results with CoReMa and photoconducitivity so you think it is possible to measure mobility-lifetime products with the contactless setup as published?
8. Will results for Photoconducitivity obtained for CdZnTe be different compared to the CdTe ones?

Práci (Thesis)
❑ doporučuji (I recommend)
❑ nedoporučuji (I do not recommend)
uznat jako diplomovou/bakalářskou (to accept as master thesis).

Navrhuji hodnocení stupněm (I suggest to evaluate as) :
❑ výborně (excellent) ❑ velmi dobře (very good) ❑ dobře (good) ❑ neprospěl/a (not passed)

Místo, datum a podpis vedoucího/oponenta (Place, date and signature of the reviewer):

Freiburg, 10.9.2012

Prof. Dr. Michael Fiederle
Albert-Ludwigs-Universität Freiburg