CZECH TECHNICAL UNIVERSITY IN PRAGUE
Faculty of electrical engineering
Department of electrical power engineering
Technická 2, 166 27 Prague 6, Czech Republic

Bachelor thesis opponent's review

Master thesis:	**Stability and aging of perovskite solar cell materials**
Author:	**Jimi Xu**
Thesis supervisor:	**Ing. Jaroslav Kuliček, Ph.D.**
Thesis opponent:	**RNDr. Martin Ledinský, Ph.D.**

Rating (1 – 5)
(1 = best; 5 = worst):

1. Fulfillment of assignment requirements:	1
2. Systematic solutions of individual tasks:	1
3. Ability to apply knowledge and to use literature:	2
4. Thesis formal and language level:	3
5. Thesis readability and structuring:	1
6. Thesis professional level:	2
7. Conclusions and their formulation:	1
8. Final mark evaluation (A, B, C, D, E, F):	A

verbal:
Excellent

Brief summary evaluation of the thesis (compulsory):

The general task of this theses is to remeasure properties of two years old perovskite samples with different composition and layer stacks. The candidate used many different characterization techniques and interpreted the measured data. This is nontrivial task for scientist at this stage. The discussion was sometimes not fully clear. For example, it will be great to see directly the two years old results, not just the description (colors of white light images, or AFM topographies). The English is sometimes hard to read, but in general the text is understandable. The last weak point is cited literature – mainly in the introduction. There are much more important manuscripts than 1 or 2. These should be used for comparison of all the measurement exclusively.

Questions:

1. Perovskite solar cells are named as an example of the third generation of photovoltaic. Why? What is the definition?

2. Page 11 – "samples were taken from vacuum boxes" Is this correct? Usually the samples are stored in nitrogen.
3. The change of the color to yellow is clear sign of degradation – decomposition into PbI2. It has large band gap at roughly 530 nm, so it is yellowish. This decomposition is helpful for interpretation of AFM images or Kelvin probe study.
4. The PL image resolution is given by laser spot size on the sample. For 50x objective and 532 nm excitation it should be around 1 um. So, what is the meaning of the very small spots at Fig. 3.3 on right. Can you show how the typical spectra in this area looks like? Isn't it the noise?
5. What is the standard measurement to prove perovskite or PbI2 composition.

Date: 10.6.2022   Signature:

Notes:
1) The total thesis evaluation needn't be determined by the partial evaluations average.
2) The total evaluation (item 8) should be from the following scale:

excellent	very good	good	satisfactory	sufficient	insufficient
A	B	C	D	E	F