

Opponent's review of the Master's Thesis

Title: "Thermally and optically modulated desorption of gases on chemical sensor layers"

Author: Bc. Martin Hruška

Opponent: Ing. Sergii Chertopalov, PhD.

The master thesis presented by Bc. Martin Hruška is dealing with the study of physical-chemical processes on the surfaces of the structured metals and organic materials (phthalocyanines). The author used two methods for this study. First is the electrical measurement of conductivity and the second one is measurement the resonance frequency of a quartz crystal microbalance (QCM). The main parameters for the desorption of atoms and molecules (regeneration of chemical sensors) are thermal and light-stimulated desorption. It is worth noting that Martin made/modified and studied real sensors (chemoresistors and QCM), and also used such a complex method as impedance spectrometry for studying. The author has developed a setup as well as a new methodology and software for testing chemoresistors and modified QCM. The thesis is written in good English and consists of 111 pages of well-structured text including references. This thesis is well illustrated. Based on this research Martin Hruška with co-authors published a paper in ACS Sensors.

As a remark, I can say that links are not in a single format, but this does not diminish the importance of the work.

I believe that Martin's master thesis was done at a high scientific level and **I recommend it for defense**, and the author deserves an **excellent (A) mark**.

Questions for defense:

- 1) Starting from a certain thickness, a quartz resonator cannot correctly determine the change in film thickness, therefore in vacuum systems for film deposition it is replaced with a new one. What criterion was chosen in your case (Table 3.3, page 39), since the Pd film was 4.5 microns thick? Why the thicknesses for Au and Pd are different?
- 2) Figure 4.8. How you can explain the positive shift of the resonance frequency under irradiation?
- 3) What will be with desorption if you use UV irradiation for black metals?
- 4) What you can say about stability of sensors based on phthalocyanines? I think it is very important for real sensors.

In Prague, May 24, 2019

Signature