

Opponent Review

on the Habilitation Thesis submitted for Associate Professor position

by **Dr. Viktor Johánek** / Charles University – Faculty of Mathematics and Physics

Prepared by **Prof. Dr. András Berkó**

University of Szeged and The Hungarian Academy of Sciences

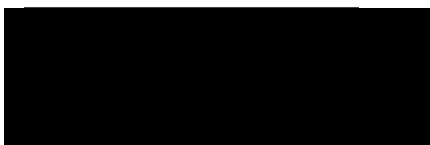
H-6720 Szeged, Dóm tér 7, Hungary / e-mail – aberko@chem.u-szeged.hu

The Habilitation Thesis submitted by Viktor Johánek (Applicant) and titled of „Reactions at surfaces: from macroscopic to molecular level” contains a very dense, detailed and scientifically valuable summary (60 pages) of the research activity and results over the last 10 years achieved by the applicant. He confirms overwhelmingly his deep&wide awareness in his scientific topics by 628 references. As Appendicies, the relevant 18 publications are also attached and they are systematically refered in the bulk text of the Thesis. These papers appeared in highly ranked international journals with an average journal impact of ~5. This value is an outstanding score, which is consolidated by the independent citations per paper of more than 30 as an average.

The main conceptional motif of the dissertation is to find synergetic connection between the surface science and the heterogeneous catalysis, as disciplines. It is well known that the idea of elaboration of modern ultra high vacuum technique and surface science was mainly stimulated by the heterogeneous catalysis and by the microelectronics in the sixties of last century. This effort resulted in a huge mutual impact connecting the efficient applied technologies and the fundamental research activities. Nowadays the developed nanoelectronics, the construction of high-tech nanosensors and the development of ultra-efficient catalysts (and photocatalysts as well) are almost commonly treated systems both in technology and theory. To connect immediately the principles of operation of macroscopic level devices with the atomistic level concepts of the material is in the real focus of the modern research activity. Accordingly, the topics presented in the Thesis offer a top level scientific scope which is a very worthy function at a pre-eminent university like Charles University. Concerning the wide international cooperations, the papers of the Applicant provide a clear evidence, which includes also the fact that the Applicant has a very extended international experience, which is furtherly judged by the several years research work at excellent research sites like Fritz-Haber Institute Berlin, University of California Irvine, University of Virginia, Elettra Sincrotrone Trieste.

The bulk text of the dissertation concentrates to three main fields: (1) CO_x and NO_x surface chemistry; (2) Surface chemistry of water; (3) Surface chemistry of organic molecules. All these topics are strongly connected to the environmental protection and to the modern energy science technologies which are key issues of nowadays. Nevertheless from the point of view of the fundamental research, the dissertation delivers also very valuable knowledge on the oxide-metal interfaces, on the vacancy distribution and role on oxides, on the transient species behaviour over the surface chemical reactions and on the formation of new 2D materials. Concerning the latter case, we can be sure that the present experience of the Applicant promises a further exciting fundamental research and important results in this field during the next decades.

Concluding my evaluation on the Thesis, I am deeply convinced that the scientific activity of Viktor Johánek up to now makes him a very promising leading researcher and tutor, so he is worthy for Associate Professorship.



Hungary, Szeged, 3 June, 2019

András Berkó