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Faculty of Mathematics and Physics
Charles University
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Re: The Evaluation Letter of RNDr. Viktor Johánek, Ph.D. Habilitation Thesis

Dear Evaluation Committee:

It is my pleasure to respond to your request for the evaluation of Dr. Johánek's habilitation thesis and to express my enthusiastic support. I have followed Dr. Johánek's research since the early days of his career when he joined Professor Freund's group as a postdoctoral fellow at Fritz Haber Institute in Berlin in 2001. His investigations are closely aligned with my interests, and I consider myself well-qualified to comment on his research contributions, scientific growth, and suitability of this promotion.

Dr. Johánek's research centers on the studies of well-defined model catalysts prepared under ultrahigh vacuum conditions that allow for unprecedented level of characterization and reveal the underlying reaction mechanisms. I find this area of research of critical importance for the catalysis field at large and Dr. Johánek's thesis undoubtedly demonstrate the extent and importance of his contributions. Throughout his career, he has developed expertise with a broad range of laboratory- and synchrotron-based surface characterization techniques and mastered kinetic reactivity studies using advanced methods such as reactive molecular beam scattering and temperature-programmed desorption. I can confidently state that Dr. Johánek's has made important contributions to a broad range of topics with high importance for fundamental and applied catalysis. His work over the

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years shows a sound thematic focus on the chemistry of Pt and Pd nanoparticles supported on alumina and ceria surfaces. This continuity in the model systems studies is a signature strength and distinguishing factor of Dr. Johánek's research.

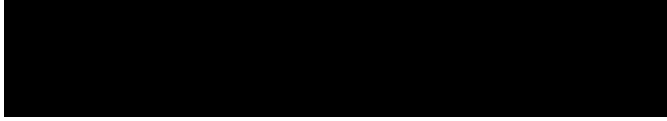
More specifically, Dr. Johánek's work focused on the understanding of CO_x and NO_x chemistry on oxide supported Pd nanoparticles, catalytic conversion of oxygenates on Pd and Pt catalysts on ceria and alumina, the interaction of water with cerium oxide, and hydrocarbon activation for the graphene growth on Pt. It is apparent from Dr. Johánek's publications that great care is always taken when exploring catalytic mechanisms, with the key rate-limiting steps characterized on well-defined structural motifs. There is a clear focus on the detailed atomic-level characterization of the catalysts' structure often *in situ* by employing a broad range of spectroscopic techniques that are closely coupled with the mechanistic reactivity studies to generate detailed structure-activity relationships. I would like to highlight few specific topics presented in his habilitation thesis in which Dr. Johánek's work particularly stands out. In one of his early seminal studies he discovered how the bistable behavior in CO oxidation depends on the Pd nanoparticle size and defects. This work resulted in publication in *Science* and is one of the seminal studies of CO oxidation on model systems. Similarly, understanding the interactions of water with ceria is of critical importance. In this topic, Dr. Johánek identified that on reduced ceria, the bulk reaction channel dominates and showed that clusters of oxygen vacancies are prerequisite for this process. In case of extensively studied graphene growth, Dr. Johánek beautifully focused on determining the temperature-dependent reaction intermediates and rates as a function of alkene chain length. These studies provided the experimental support to the model of preferred graphene growth via attachment of small carbon chains including five atoms. I could list many other examples, but I believe that these clearly illustrate the level of details and insight that Dr. Johánek strives for.

Dr. Johánek has also been highly productive, and his work resulted in over sixty peer-reviewed publications, a number of them in high profile journals and four of them invited. From this list, he is a first and/or corresponding author on twenty publications. These indicators demonstrate strong performance and continuing scientific growth that is well worth of the habilitation thesis.

In summary, after reading Dr. Johánek's papers, I always find myself rewarded with a deep molecular level understanding that I also strive for. There is no doubt that Dr. Johánek is an outstanding scientist. From my encounters, he is also a very nice person. I enthusiastically endorse his promotion without any reservations.

Please do not hesitate to contact me should you require any additional information.

Respectfully,



Zdenek Dohnalek, Ph.D.

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