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To  
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## **Habilitation thesis “Epitaxial Graphene on Silicon carbide”, provided by Jan Kunc**

First of all, I would like to disclose that Jan Kunc is a colleague whom I have met several times at conferences and once also during a two-day visit at Charles University. However, we have never worked together, accordingly there are no joint publications or projects. Therefore, I do not feel biased in evaluating his scientific achievements. Prior to the review, I already knew a substantial part of his publications. Today, I am evaluating in particular the presented habilitation thesis. I understand the habilitation as a process in which the host university certifies the suitability and scientific qualification as a professor by evaluating his teaching and scientific achievements. A plagiarism check from my side was inconspicuous.

Jan Kunc has become an expert in epitaxial graphene on SiC. He became acquainted with this material during his postdoctoral stay in Atlanta in the research group of Walt de Heer, who is undoubtedly a pioneer in this field. Back in Prague, he built up a fabrication line that nicely grows high-quality graphene, and further uses various instruments. Different to de Heer, he is not focused on the SiC000-1 facet but explores the whole zoo of graphene allotropes. Jan Kunc papers cover a variety of methods, including electrical measurements and spectroscopy.

The introductory part, which in the cumulative thesis should provide an introduction to the topic and a classification of one's own work in the overall scientific situation, has two different sides. Let us first deal with the introduction to the material system graphene. In chapters 1 and 2, Jan Kunc describes the electronic structure of graphene knowledgeably and precisely. However, one has to put this into perspective. Since graphene has been described very comprehensively, common wordings with other manuscripts are unavoidable and it is not at all easy to set one's own accents here. C. Against this background, I find especially the section 2.3 "Common Misconceptions" very nice, where Jan Kunc can present his very good understanding of the underlying physics well.

In Chapter 3 and 4, the preparation of epitaxial graphene is carefully introduced. It contrasts the most common methods, exfoliation and vapor deposition, with the epitaxial method on SiC, which involves the sublimation of Silicon atoms and subsequent reconfiguration of the surface. This is Jan Kunc's domain, and he describes it very clearly. In particular, presents briefly the fabrication of several allotropes of the graphene-like  $sp^2$ -carbon family.

As the core of his scientific achievements, Jan Kunc presents 15 original papers. His personal contributions are explained in chapter 5 and, knowing Jan Kunc, Walt de Heer, Claire Berger and many others of his collaborators for many years, I have no doubt that this is openly and correctly described. He has a good balance of teamplay and his own contributions. His contributions range from first authorship to supervisorship. The emphasis of his research is on detailed material aspects. He studies in detail peak shape of Raman peaks, detailed studies of growth parameters. A particularly interesting example from this series is the APL paper from 2014, in which graphene growth is studied on an unusual facet of the SiC crystal. I appreciate this research very much. In solid-state physics, details are often important to understand the physical properties and Jan Kunc is the right person to study, interpret and understand them adequately. A second bunch of paper is dedicated to functional devices. This includes an unconventional planar transistor (I personally read this paper with great interest), electroluminescence, a detachment protocol etc. I would underscore that this functionality is the consequence of a thorough understanding of the system. Among the papers I read the paper "Contactless millimeter-wave method..." with highest interest. I knew about these results in an earlier stage when visiting Stuttgart university, I heard there also about the highly significant contributions from Jan Kunc and I find the results very mature.

Finally, papers which are related to different material systems elucidate magnetotransport and magneto-optical phenomena, which are excellent work as well.

Jan Kunc's research is focusing on few materials, but the (solid-state-) physics covered is nevertheless relatively broad. I appreciate his thorough manner, his nuanced and thoughtful consideration of experimental findings, and the functionality that he derives. In de Heer's large working group he has taken responsibility and achieved a number of very nice results. Since he is back in Prague, I suspect a smaller methodology at his disposal. I was, however, surprised to see that by now, 42 theses are listed under his supervision, because I considered his group as relatively small. This, however, underscores his dedication to teaching. From his very insightful, well-prepared and clear presentations at conferences, I have no doubt that he is a good physics teacher.

An analysis of his scientific output in terms of numbers leads to ~90 citations per year, altogether 700 and an h-index of 13, which I find very good and adequate for his scientific age.

Altogether, Jan Kunc has a very good and international track record in science and teaching, he is a well-recognized and well-respected colleague who has demonstrated independent high quality research. Therefore, I have no hesitation in recommending the habilitation to Charles University, and I strongly support the award of the *venium docendi*. I will continue to follow Jan Kunc's scientific contributions with great interest.

As a friendly advice, I would recommend that the Kunc group provides a better web page. I think this is important for young investigators to shape their own profile and to get additional visibility both with respect to local students and internationally.

Sincerely yours,

