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Review of the PhD thesis

Author: **Ing. Jakub Veverka**
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Topic: **Thermal stability of tungsten alloys**

Dissertation thesis of Ing. Veverka deals with the development of materials applicable in the environment of fusion reactors. It focuses on the possibilities of producing tungsten alloys with self-passivation capabilities, respecting the requirements for increasing the safety of operation of future fusion reactors. It deals with the production of mechanically alloyed powders, enabling the subsequent creation of alloys with the required properties using Field Assisted sintering technology. The topic addressed is very relevant to the challenges society faces in the field of energy.

The work itself is made up of 9 chapters, including introduction containing the motivation for the conducted research, review of literature relevant to the solved problem and definition of the main aims of the theses. The methodology, achieved results and discussion are presented in the form of a summary of 4 published articles, of which Mr. J. Veverka is the main author.

Relevance

The relevance and importance of the discussed topic is described in the thesis in the Introduction chapter. A relatively detailed description of the current situation in the area of available energy sources and the related environmental burden is provided. This introduction is followed by an explanation of the motivation and necessity of the presented research in terms of its contribution to a possible future reduction of the ecological burden in energy production. I rate this placement in a wider social context very positively, it allows even a less knowledgeable reader to realize the importance of specific research in the field of energy materials.

Novelty

The introductory chapters, describing the principles of fusion reactor function, the working conditions of extremely stressed components and situations, and the critical conditions that may occur in the

event of an accident and which the materials of selected components must withstand to ensure the safety of reactor operation, are followed by chapters describing the current state of knowledge in the field of development of materials that are considered in connection with the application in fusion reactors. Based on the conducted and presented literature research, the research objectives of the work were defined. The novelty of the proposed and implemented research is clearly defined by these goals in relation to the current state of knowledge.

Methods used, results and partial conclusions

The experimental part of the work is presented as a collection of four articles, published in impacted international journals. The importance and contribution of individual articles is commented on in the accompanying text, the articles are logically arranged one after the other in such a way that it is possible to follow the progress of solving the individual sub-objectives of the work. The accuracy and detail of the description of the methodology, the presentation of the measured results, their discussion and the drawing of partial conclusions were the subject of in-detail review during the articles publication process, so there is no need to doubt their quality. The accompanying brief description of the content of individual articles and their importance for achieving the overall goals of the work makes it easier for the reader to perceive the presented work as a whole.

The main conclusions are summarized clearly in the final chapter. Based on them, it can be concluded that the objectives of the work, defined in chapter 7, have been achieved. However, for a clearer assessment of the degree of achievement of the objectives of the work, it would be appropriate to relate the individual stated conclusions to the individual objectives.

The formal preparation and language level of the dissertation is fully satisfactory.

Final assessment

The submitted dissertation is of high quality. The presented research can be considered as highly up-to-date, the findings are novel and their potential for future utilization is high.

Mr. Jakub Veverka demonstrated the ability of systematic scientific work, analysis, interpretation, and discussion of results. During his studies, in addition to 4 of his own articles mentioned in the thesis, he participated as a co-author in the publication of seven other articles in high-impact journals.

Based on the above evaluation, **I do recommend the dissertation for defense.**

The opponent's question to the defense of the doctoral dissertation:

The composition of the tested alloys (W-Cr-TA and W-Cr-Hf) was based on the W -10 wt. % Cr ratio. On what basis was 10 wt. % of Cr chosen?



Šárka Houdková Šimůnková