REVIEW

over dissertation for acquiring educational and scientific "PhD" degree

Author: mag. eng. Bogomil Dimitrov Popov

Subject: **„High-temperature treatment of materials and alloys that contain nanoelements "**

Discipline: 5. Technical sciences,

Division: 5.2 Electrical engineering,. Electronic and Automation;

Scientific Area: 02.21.07 "Automated systems for information processing and management";

Jury member: Prof. Dr. Todor Dimitrov Neshkov, TU-Sofia;

The dissertation has 126 pages, divided in four chapters and conclusion. 107 references are quoted, including webadresses. Within the dissertation 9 publications are presented and a patent application (one of which is single). One of the publications is included in a journal, 6 in local conferences and 2 abroad. There are no student's publications quoted. There are no documents for defending an intellectual property.

1. Accuracy of the problem solved in the dissertation in scientific and scientifically-applied matter.

The dissertation is related to contemporary and perspective field in automation systems for high-temperature treatment of materials and alloys containing nanoelements. There are a lot of publications, researches and solutions on this topic worldwide, but on local level, they are rare. This presumes the actual matter of the research in scientifically applied case.

2. Problem and literature understanding degree and authros interpretation over the material

Broad literature overview of the current means, methods and thenologies for high-temperature treatment of materials with nanoelements is made. 107 sources are quoted and own publications are made.

The analysis shows that the author has researched and deeply understands the condition and the problems in this area. The conclusions from the overview and the analysis are well systematized. The goal and the tasks of the dissertation are properly presented.

3. Congruence betwen the goal and tasks and the achieved results

In the dissertation, an approach for solving a desired task is theoretically tested and practically worked out and the results show that the used methods can be successfully applied for

discovering new results with real objects. The conclusions form the overview and the analyses are well systematized and the goal and tasks are well founded and respectively presented. It can be concluded that the author has chosen and applied appropriate research methodology according to the desired task and goals.

4. Characterization and evaluation of the dissertation

The dissertation makes a good impression with deep knowledge of the problems, the using of propriate means for describing physical events and processes with different efficiency testing, the formulating of original algorithms and toos for increasing the quolity of the results. A rich set of experimental work is presented for the results and their application and there is connection between the experimental work and the theorethical part.

After deep analysis and systematisation of the methods and means for high-temperature treatment of materialsa and alloys consisting nanoelemnts, the disertation tasks are formulated.

The goal of the disertation is a high-temperature processes for creating materials and alloys to be researched and an innovative technologies to be applied for creating new materias and alloys using nanoelements. For compleating this goal the following task are achieved:

- Overview, analysis and systematization of high-temperature technologies for creating materials and alloys and their realization are made,
- Overview, analysis and systematization of different micro and nano materials in the researched field
- Research of common high-temperature processes for syntesis and sintering of metals
- A strusture, organisation and content of Taman's furnance technological line is presented
- An optimisation of technologiacal processes and timeline is made concerning the production with Tauman's furnance,
- An innovative high-temperature technology is developed for creating diamond tools,
- An innovative high-temperature technology is developed for sintering of silicic carbid,
- An innovative high-temperature technology is developed for sintering of borone carbid
- An innovative high-temperature technology is developed for sintering and compression of hard materials.

For confirming the research work the following experiments are carried out:

- Experiments for confirming the results from the developed innovative high-temperature technologies for creating diamond tools with liquid agregate,

- Experiments for confirming the results from the developed innovative high-temperature technologies for for sintering a silicic cabid with liquid agregate,

- Experiments for confirming the results from the developed innovative high-temperature technologies for sintering a borone cabid with liquid agregate,

- Experiments for confirming the results from the developed innovative high-temperature technologiesfor for sintering and compresing of hard materials,

- The results are analysed

An innovative high-temperature technologies are presented in order to achieve better characteristics of the new materials and alloys. The right chosing and application of nanoelements can significantly increase the quality of the production and the energy efficiency, which will lead to decrease production's time and budged.

I possitevely aprechiate the credibility of the researches and the acomplished contributions.

5. Scientific and scientifically-applied contributions in the dissertation

I accept the contributions with scientific and scientifically-applied character, that the author has formulated. An additional consolidation and refinement could be made. The orientation toward the consumers makes a good impression.

The presented scientific and scientifically-applied contributions can be added to the following groups: proving new significant sides of already examined scientific areas, problems, theories, hypothesis; discovering new classifications, methods, constructions, technologies and achieving solid factors, constructions and methods for enriching existing knowledge with practical application.

6. Evaluating author's personal participation in contributions

The PhD student personally does the dissertation and its contributions. I have personal observations over author's good work and his deep researches in this new and interdisciplinary area.

7. Assessment of the publications whithin the dissertation paper

Along with dissertation 9 publications are made, 1 of which are made without side participation. It is proven that the results have been popularized within scientific community. The publications will reflect the work and the achieved results and popularize them.

8. Real use of the dissertaion's results

The presented methods, researches and developed solutions can be used for testing the development and the optimization of different technologies. They are good prerequisite for widen the work over the topic along with other methods and for commercialization of the scientific results.

9. Asssesment of the autoreferate with the requirements

The autoreferate respond to the desired format and to dissertation's contents and authentically reflect the main contributions of the work.

10. Notes, advices and comments

The dissertation stand out with deep topic knowledge, precision and desire for problem solving research from different point of view and finding a working practical solution. The area of work is modern with further development perspective.

I had some notes and remarks for the PhD student, which I have pointed out personally and has been taken in consideration.

As an advice, I would recommend the future work to be oriented toward more own publications in international journals and in intellectual property defense.

CONCLUSION

The author has done deep analysis of the problem and has presented a detailed solution in new and perspective area. **All requirements of ЗРАСРБ, the application manual, and the special requirements for gaining a PhD title in IICT-BAS are fulfilled,** based on the volume and the quality of the dissertation paper.

Based on that, I positively evaluate the paper and suggest that **mag. eng. Bogomil Dimitrov Popov should graduate with educational title " Doctor"** in Discipline: 5. Technical sciences, Division: 5.2. Electronic, Electrical engineering and Automation, Scientific Area: 02.21.07 "Automated systems for information processing and management".

Sofia, 3 June 2019 г.