Universitatea *Transilvania* din Braşov

HABILITATION THESIS

SUMMARY

CONTRIBUTIONS ON THE USE OF SOLAR ENERGY FOR MODIFYING THE PROPERTIES OF SPECIAL ALLOYS BY HEAT TREATMENTS

Domain: Industrial Engineering

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(A) SUMMARY

The habilitation theses ***"Contributions on the use of solar energy for modifying the properties of special alloys by heat treatments"*** summarizes the most important scientific and professional results obtained by the author after being awarded his PhD (1998 at the "Transilvania" University of Brasov) and after receiving tenure as a professor in 2001 at the "Transilvania" University of Brasov, faculty of Materials Science and Engineering.

Section ***(B-i) Scientific and professional results*** contains, besides the introduction, a chapter regarding the scientific experience alongside 3 chapters which offer details of the most important accomplishments of the author.

The **Introduction** provides an overview of the advantages and disadvantages of developing applications for concentrated solar energy heat treatments for modifying the properties of special alloys, with the mention that the research conducted and presented in this thesis falls within a field of growing interest, that of renewable energy in industry.

There are presented the special alloys used in the experimental research (steel, alloy cast iron), noting that the research was conducted both on standard materials as well as on materials with chemical compositions modified through further alloying in different percentages and by modifying the industrials parameters of the heat treatments, which added a new perspective to this research.

Chapter 1 (**Tendencies concerning the use of solar energy in industry**), there was taken into account the fact that part of the industrial sources that produce electric energy lead to pollution and, therefore, the focus was on the study of solar powered energy, a non-polluting and renewable energy, as a basis for future scientific research.

There is also an emphasis on the fact that this research is considered a priority by the European Commission due to its positive impact on reducing pollution, in conformity with the "European Strategic Energy Technology Plan (SET-Plan): Towards a low carbon future" and thus 16 billion euros have been allocated for research and development until 2020.

With that in mind, the research presented in this habilitation thesis is in line with the current trends and priorities to capitalize on new research findings to enable industrial development as well as to encourage the development of non-polluting renewable energy.

Chapter 2 (**Contributions on the use of solar energy for modifying the properties of heat treated special alloys**) presents the experimental results of using solar and electric energy (through comparison) in the study of heat treated special alloys. Starting with the presentation of the solar oven used to conduct the experimental research, the analysis was carried out by comparing the micro hardness values, the reactions to low temperatures and the tribology of the special alloys.

The results were satisfactory, showing that the treatment of alloys with solar energy resulted in values similar to the treatment using electric energy while maintaining the professional requirements of different industrial sectors (automotive, petrol, extractive, etc.).

Chapter 3 (**Processing by statistical analysis, mathematical modelling and optimization of experimental data**) presents data on the processing of experimental data through statistical analysis, modelling and optimization.

In the research, two personal computing programs were presented, used in compiling the data frequently used in functions and written in C++ (tested and corrected by the author), which help with requests of modelling and optimization with a high degree of generality.

Section ***(B-ii) Plans of career development*** is divided in 2 subchapters: ***I. Work experience*** (1983-1989) presenting the research and teaching activity specific to being a technology engineer at "Tractorul" Brasov (1983-1986) and "Rulmentul" Brasov (1986-1989); ***II. Work experience with "Transilvania" University of Brasov (1989-present)*** presenting the two main directions of development: the teaching activity (educational) and the research activity.

Section ***(B-iii) Bibliography*** contains 130 references connected to scientific and professional results as well as the plans for career progress and development (B-ii).

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