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MECHANICAL ENGINEERING DEPARTMENT

DIPLOMA PROJECT

DESIGN OF A SOLAR CELL

by

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ABSTRACT

This project has been constituted of six chapters.

Chapter one basically deals with the investigation of various compounds in order to be decided the best solution for our design.

Chapter two analyse the process which decided in order to stick together the two constitutes of the compound(Mo & Si) .The process is called *Spray drying.*

Chapter three deals with the preparation of the powder.

Chapter four deals with the consolidation of the compound.

Chapter five deals with the experimental set-up involves the processing of the powder sample in a tubular furnace constructed in Cyprus.

Chapter six deals with the conclusions of the whole designing and it was mentioned about the difficulties presented in order to be constructed the furnace and the help we had in order to achieve it.

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INTRODUCTION

In a consuming society such is ours energy is very important for the satisfaction of the needs of all the humanity and for the evolution of technology. It is known that the familiar sources of energy are tending to vanish(petroleum ,gas) . So it is crucial to be found alternative energy sources to satisfy the increased demands of energy . A good solution to the energy problem is the use of the use of the sunlight and somehow the conversion of it to electric current.

This conversion of solar radiation it can be done by the use of solar cells , the so called photovoltaic plates. The photovoltaic plates consist mainly of semiconducting materials. When light energy or photons strike those materials internal voltages are created.

In the presented project they were examined several materials for photovoltaic plates , such as:

- Single-crystal silicon.
- Cast multicrystal silicon (or cast polycrystalline Si)
- Thin-film polycrystalline silicon
- Amorphous silicon
- Copper indium diselenide
- Cadmium telluride
- Group III - V materials
- Multiquantum wells (AlGaAs Quantum-well)
- Iron sulphide
- Nano-crystalline (dye-sensitised) thin films
- $MoSi_2$-based high temperature structural silicides

The most suitable compound it was found to be the $MoSi_2$. So the next step was to find the proper experimental procedure in order the two constitutes

of the compound to stick together in order to be achieved the higher possible efficiency for the solar plate.

So it was used a new ,revolutionary process the so called spray drying process. Spray-drying is capable of producing a granulated, highly flowable powder of uniform bulk density and controlled moisture content. Properly done, it is a continuous and cost-effective manufacturing operation. The slurry character is the major factor controlling the bulk density of the granules; higher solids-content will result in higher granule densities. Thorough characterisation of the feed material and the powder is required for process optimisation.

The next step was to achieve consolidation of the compound. In chapter three was descripted briefly the method for achieving the joint and consolidation of Si in Mo.

The preparation of the powder is of great importance in order to be completed successfully the experiment. They are several parameters to be considered in order to achieve that, like degassing of the tubular furnace. The preparation of the powder was descriped in chapter four.

The next thing to be mentioned is a description of the experimental set-up. It involves the processing of the powder sample in a tubular furnace which is something completely new for the data of Cyprus. It can be easily understood that we found great difficulties for the completion of the furnace dew to lack of experimental engineering research in Cyprus. The operation of the furnace was descriped in chapter five.