

The solar cells of the future

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One of the main challenges society currently faces is to supply the world with sufficient energy. At the start of the 19th century the industrial revolution introduced a way to make machines do an extraordinary amount of work and tasks that no human could do. Fossil fuels like oil and coal were used to supply heavy machinery with enough power such that they could function [1]. Nowadays energy is not only used to operate engines and machines, but a large variety of electronic household appliances such as computers and television sets. However, fossil fuels have two big disadvantages. Firstly the sources are not sustainable. Therefore, one will run out of coal and oil reservoirs in under a century. Moreover, in order to access the energy stored in fossil fuels it has to be burned which causes a huge emission of the gas CO_2 . This greenhouse gas contributes severely to climate change, which harms natural ecosystems [2].

As a counter reaction humanity has been trying to find energy sources which do not emit CO_2 and are sustainable. A good candidate are solar cells. With solar cells it is possible to store the energy given to us for free by the sun. Nonetheless, the solar cells which have been produced so far still have a relatively low efficiency [3].

For this reason, scientist are conducting a lot of research regarding the optimization of the efficiency of solar cells. In order to understand what conclusions were drawn in the thesis one first has to understand the basic principle of a solar cell. To produce a solar cell one fabricates a film of two semiconductors together. A semiconducting material has the property that it conducts less electricity than an ordinary conductor. Due to the physical properties of two different semiconductors combined together, a current can be generated when light is illuminated on it [4].

In the thesis an idealized model of such a solar cell was made. Typical quantities such as its efficiency and net power were determined for different relevant parameters. The model used in the thesis was rather simplified but important trends for different variables were observed which can be used in future research.

References

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