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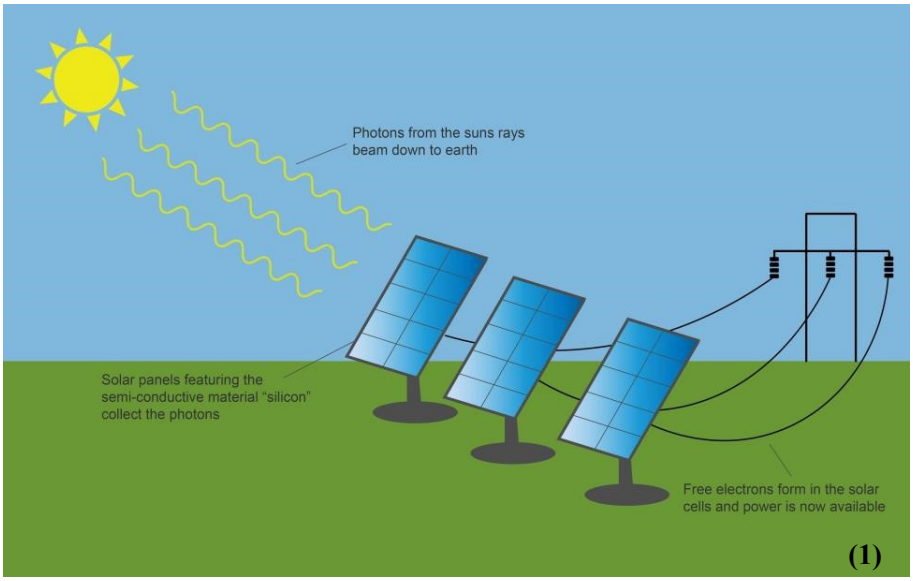
Can Solar Energy take over Power Generation?

Imagine a world where we would not have to rely on petrol, gas or coal resources and instead we would simply take what Mother Nature gives us every day - the sunlight. The idea of using light as a source for power generation struck many scientists more than 50 years ago, not long after it was realised that the energy carried by light rays could be converted into electricity through so-called solar cells as shown in the figure below.

Since then, many different technologies and a great variety of materials have been implemented in the design of solar cells. Nevertheless, the energy conversion rates in commercially used solar cells have yet not climbed over the 20% efficiency mark. Due to the accelerating climate change resulting from burning of fossil fuel, such as coal and petrol, the need for a more efficient solar cell design has yet not been greater.

It is the great potential of solar energy that drives not only the scientists in NanoLund, Lund University's Nanoscience Research Centre, but around the whole world to find an alternative solar cell model based on nanowires which promises an inexpensive and a large-scale manufacture of solar cells. Such a cell is made of "wires" consisting of repeating units of various materials. The prefix *nano* appears since the size of these wires is on the order of nanometers, which is around 10^{-9} meters. To visualise this, the diameter of a nanowire is around 37 000 times smaller than a human hair strand. It is this fascinatingly small size of these devices that makes them so attractive as less material is necessary for their manufacture and thus a higher quality material can be used without increasing the price dramatically. Working on the scale of nanometers, nanotechnology promises new materials, structures and mechanisms which could ease the conversion from solar to electrical energy and at the same time limit the costs of the production. My thesis, in particular, is a theoretical study of how the conversion process could be made more efficient when an nano-engineered electron filter, selecting only electrons of certain energies for the generated photocurrent, is optimised and used.



(1) Figure taken from: Clean energy ideas, https://www.clean-energy-ideas.com/solar/solar-panels/solar-panel-diagram/, visited on 13.12.2018