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Make hay while the sun shines.

Nanoscience: hitting it big.

Solar cells play with no doubt an important role in the production of sustainable energy. Contributing to their efficiency in both, cost and energy gain is the goal of this project. To succeed we had to dare to leave the trodden path trying out new methods.

One big problem in the solar industry is the very low efficiency of affordable solar cells, using only about 5% of the solar energy. This is now countered making use of tiny standing wires, called nanowires, instead of continuous bulk material.

These nanowires are very small, having a diameter of about 100 nm which equals one thousandth of the width of a regular human hair. Their length is with several μm comparatively large. Imagining these tiny wires as minimized hairs, one can easily understand what is special about nanowires: Because of their big surface compared to their volume, entirely new material properties can arise.

Implementing nanowires in solar cells cause much smaller material consumption and therefore significantly reduces the production cost. To make this work in an efficient way, the aim of this project is to analyze the nanowires which are used in single processing steps on the way of fabricating a complete solar cell. Only in understanding these individual steps can we adequately optimize the whole system. In the process we measure the properties of single nanowires (with the help of a scanning tunneling microscope) instead of taking an average of millions of wires in a finished solar cell, how it is conventionally done. This type of conductivity measurements is quite unique, only done by a few research teams in the world.

But our research does not stop here. Additionally we are investigating properties of the lattice structure of nanowires, more specifically what structures favor or constrain the conductance of nanowires. These nanowires can then be implemented not only in solar cells, but also in various electrical devices like LEDs, transistors and sensors.

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