

S E M I N A R
aus
Halbleiterphysik und Nanotechnologie

Di, 09.2.2016, 11:00 Uhr, Hörsaal für Physik

**What is new in photovoltaics: both on macro-
and micro- scales**

Dr. Antonín Fejfar

Institute of Physics, Academy of Sciences of the Czech Republic,
Cukrovarnická 10, 162 00 Prague 6, Czech Republic

Photovoltaic solar energy conversion is becoming a major player in the electric energy industry. The story how photovoltaic cell evolved from a curiosity to an omnipresent device, being produced on truly macroscopic scale (> 40 GW power capacity per year, with over 200 GW installed worldwide) contains dramatic moments and fascinating insights and it is worth telling. Short review of the most important moments will be presented.

The present photovoltaics is totally dominated by cells based on silicon wafers which became so cheap that the cost of their encapsulation is now higher than the semiconductor devices itself. Any alternative photovoltaic technology has to challenge both the high efficiency and price levels of the silicon wafers.

One such technology might be radial junction solar cells based on silicon nanowires [1]. Their self-organized, optically thick and geometrically thin structure offers advantages with potential to reach high efficiency with very low material consumption. They also offer a fascinating challenge of how to measure the conversion efficiency in the individual junctions, each producing power on picowatt level. We apply the tip of the scanning probe microscopes as an electrical contact for probing their electronic properties of individual junctions [2]. In order to get a more complete picture, we correlate various microscopic techniques. This means we need to locate the same junctions with about a micrometre size among many others, the similar to locating a needle in the haystack.

[1] S. Misra, L. Yu, M. Foldyna, P. Roca i Cabarrocas, New Approaches to Improve the Performance of Thin-Film Radial Junction Solar Cells Built Over Silicon Nanowire Arrays, *IEEE Journal of Photovoltaics* **5** (2015) 40–45.

[2] A. Fejfar *et al.*, *Sol. Energy Mat. Sol. Cells* **135** (2015) 106–112.