CARL VON OSSIETZKY universität OLDENBURG
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spricht

PD Dr. Silke Christiansen
Institut für Photonische Technologien (IPHT) Jena

über

**“Silicon Nanowire Based Solar Cells on Glass:
Concepts and experimental processing”**

We will present concepts for the realization of silicon thin film solar cells on glass based on silicon nanowires (SiNWs). Solar cells made from this new type of material bear the potential to be cheap, since being integrated on glass substrates and since serving as light trapping structures, therefore a <3µm NW length is sufficiently long to govern >85% broad band absorption of light at around 500nm wavelength. In addition, the SiNWs can be integrated on glass with only very few extended lattice defects. This is in contrary to 2D crystalline Si layers on glass that usually contain a high density of recombination active defects independent of the method of synthesis. SiNW optimization focuses on realizing as large diameters as possible, to account for maximum absorption and at the same time for as small as possible carrier recombination active surface but pays attention to keeping the diameters small enough to maintain the low defect densities.
Successful solar cell processing with this new type of 3D nano-material requires several delicate processing steps, including the realization of pn-junctions in these 3D nanowires, the passivation of the large surface area, the realization of thermal conductive oxide layers to contact the SiNWs and the mechanical stabilization.
Different strategies to realize SiNWs on glass for the thin film solar cell application will be presented:
(typ 1) bottom-up vapour liquid solid growth (VLS) of SiNWs [1,2], catalyzed by gold particles using chemical vapour deposition.
(typ 2) top-down, self-limited wet chemical etching of a 2D multi-crystalline Si layer on glass, thereby forming an array of SiNWs which show a narrow size distribution with respect to diameter and length.
The materials processing of typ 1 and typ 2 material will be described as well as material and device characterization results using optical, electrical and structural characterization techniques.

Einladende: R. Brüggemann, G.H. Bauer