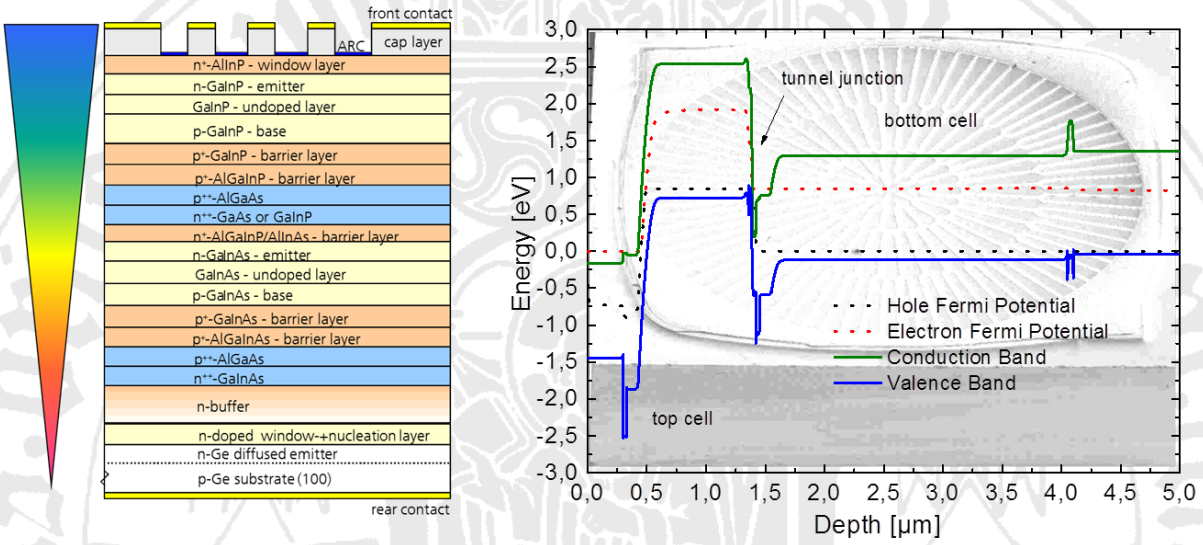
PHYSIKALISCHES KOLLOQUIUM

AM 5. FEBRUAR 2018 UM 17 UHR C.T.

IM GROßEN HÖRSAAL



GOING BEYOND THE SHOCKLEY-QUEISSER LIMIT: MULTI-JUNCTION SOLAR CELLS

DR. ANDREAS BETT

FRAUNHOFER INSTITUTE FOR SOLAR ENERGY SYSTEMS, FREIBURG

Photovoltaic technology has been developed rapidly over the last 15 year and is the major source of electricity supply in a CO_2-free energy system. The vast majority of solar cells are made from silicon. However, using only one semiconductor material limits the theoretical efficiency to 33.4%, the Shockley-Queisser limit. A path to overcome this fundamental barrier is the use of different semiconductor materials and develop multi-junction solar cells. Here III-V based solar cells are stacked on top of each other and are internally series connected by tunnel diodes. The complex cell architecture uses around 20 different semiconductor layers each of it with specific challenges. Anyway, using this technology the highest ever reported solar cell efficiency of 46.1% under concentrated light illumination has been realized at Fraunhofer ISE.

An introduction in the concept of the multi-junction solar cells based on III-V materials will be provided, followed by the challenges how to characterize and optimized monolithic multi-junction solar cells. Special effects as optical transport within the multi-junction cell architectures as well as actual research topics will be addressed.