Halbleiter-Nanophotonik

SFB 787

Einladung

Es sprechen: **Michael Schnedler und Philipp Ebert**
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Ort: **Technische Universität Berlin**
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Thema: **„Quantitative description of light-excited scanning tunneling spectroscopy"**

Abstract:

The efficiency of solar cell and optoelectronic devices is closely connected to the nanoscale distribution of charge carriers. For example, defects can give rise to non-radiative carrier recombination centers, reducing the charge carrier concentration locally. Such effects are detrimental to both the electron-light and light-electron conversion efficiencies in optoelectronic and solar cell devices, respectively. In order to understand the physical processes involved at the atomic scale, the materials used in the device structures need to be investigated simultaneously under illumination and with atomic resolution.
Photo-excited scanning tunneling spectroscopy (STS) is ideally suited to probe the illumination-induced local surface photo-voltage, band bending, carrier concentration, and the electrostatic potential distribution with atomic resolution. For a quantitative analysis, particularly of the local charge carrier concentration and redistribution, a fundamental physical understanding of the photo-excited tunneling spectra is needed. We will present a new theoretical model of photo-excited STS that incorporates a fully three dimensional solver for both, the electric field and the (intrinsic and photo-excited) carrier concentrations near the semiconductor's surface. In order to take into account both, the tip induced band-bending and the photo-excited carrier concentration, we present a modification of the tunnel current model of Feenstra and Stroscio by introducing Quasi-Fermi levels. The computations are in good agreement with experimentally obtained data, corroborating the validity of the new model. Furthermore the present results form a promising basis for the future characterization of charge carrier distributions with atomic resolution.

Gäste sind herzlich willkommen!
Prof. Dr. M. Dähne