

# DIESE WOCHE

## PHYSIKALISCHES KOLLOQUIUM

des Fachbereichs Physik  
der Johann Wolfgang Goethe-Universität Frankfurt

Mittwoch, den 24.04.2013, 16 Uhr c.t.  
Großer Hörsaal, Raum \_0.111,  
Max-von-Laue-Str. 1

**Prof. Dr. Mischa Bonn**

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***„ Fundamentals of Charge Carrier Dynamics  
in Photovoltaic Materials “***

The conversion of light into free electron-hole pairs in the conduction band of semiconductors underlies both photodetectors and photovoltaic applications. In most semiconductors, the excess photon energy, i.e. the photon energy in excess of the band gap, is lost as heat, i.e. transferred to lattice degrees of freedom. For photon energies exceeding twice the band gap energy, a modest amount of excess energy can end up in electronic degrees of freedom through a process called impact ionization, or carrier multiplication, where a photo-excited, „hot“ electron relaxes by exciting additional electron-hole pairs across the band gap. Such a process is of high technological interest, as it provides multiple charge carriers for the ‘price’ of one photon.

We use Terahertz (THz) spectroscopy to quantify the carrier density and mobility following optical excitation, with different photon energies, of semiconductors and semiconductor nanostructures. THz spectroscopy uniquely provides ultrafast, contact-free measurements of the (local) photoconductivity.

We report a THz study of carrier multiplication in several semiconductors and nanostructures, including graphene. While for most materials carrier multiplication is remarkably inefficient, graphene is an exception, and shows very efficient coupling of photon energy into the electronic system. While of interest for photo-detectors, the bandgap-less nature of graphene makes it less useful for photovoltaic applications. Here, the bandgap that appears due to confinement in graphene nanoribbons may be useful. The question that immediately arises, is whether charge transport in graphene ribbons is as efficient as in extended graphene. We quantify mobility in graphene nanoribbons using THz spectroscopy.

Die Dozenten der Physik

# Kolloquium

<http://www.uni-frankfurt.de/fb/fb13/Termine/index.html>