



PHYSIKALISCHES KOLLOQUIUM

Vortrag:

Prof. Dr. Isabella Gierz-Pehla

University of Regensburg,
Institute for Experimental and Applied Physics,
Regensburg



Thema:

Ultrafast charge transfer in van-der-Waals heterostructures

Zeit und Ort:

Dienstag, 21.12.2021, 16:40 Uhr / Online-Kolloquium in Zoom

Zoom-Meeting: Meeting-ID: 826 9098 3281 / Kenncode: PK-21!-IG

<https://tu-dresden.zoom.us/j/88236773230?pwd=NUVqZnBaZnp2SDJlK2lvaVkc04vdz09>

Leitung:

Prof. Dr. Stefan Kaiser

Kurzfassung:

Van-der-Waals heterostructures show many intriguing phenomena including ultrafast charge separation following strong excitonic absorption in the visible spectral range. However, despite the enormous potential for future applications in the field of optoelectronics, the underlying microscopic mechanism remains controversial. Here we use time- and angle-resolved photoemission spectroscopy combined with microscopic many-particle theory to reveal the relevant microscopic charge transfer channels in epitaxial WS₂/graphene heterostructures. We find that the timescale for efficient ultrafast charge separation in the material is determined by direct tunneling at those points in the Brillouin zone where WS₂ and graphene bands cross, while the lifetime of the charge separated transient state is set by defect-assisted tunneling through localized sulphur vacancies. We verify that the model also applies to heterostructures made of bilayer WS₂ and graphene where the WS₂ layer exhibits an indirect band gap. Next, we investigate the role of intervalley scattering by exciting the WS₂/graphene heterostructure away from the K-point close to the Σ -valley. Finally, we will briefly discuss the role of coherent phonons, the twist angle between the layers, and an additional carbon buffer layer at the interface between graphene and SiC(0001) substrate. The subtle interplay of intrinsic and defect-related charge transfer channels revealed in the present work can be exploited for the design of highly efficient light harvesting and detecting devices.

Biographie:

since 04/2019: W2 professor at the Institute for Experimental and Applied Physics at the University of Regensburg; 2013-2019: Leader of an independent research group at the Max Planck Institute for the Structure and Dynamics of Matter in Hamburg, Germany; 2011-2013: Postdoc in the Condensed Matter Dynamics Department of Prof. Andrea Cavalleri at the Max

Mitglied von:



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Wissenschaft
und Kultur

Planck Institute for the Structure and Dynamics of Matter in Hamburg, Germany; 2007-2013 PhD student in the department for nanostructure physics of Prof. Klaus Kern at the Max Planck Institute for Solid State Research in Stuttgart, Germany; 2001-2007: Studies of Physics at the University of Würzburg, Germany, and the Université Joseph Fourier in Grenoble, France // 2011: Otto Hahn Medal and Otto Hahn Award of the Max Planck Society for the discovery of a giant spin splitting on semiconducting surfaces; 2019: ERC Starting Grant.

Get-Together

Im Anschluss an das Kolloquium (ca. 18 Uhr) sind Studentinnen und Mitarbeiterinnen eingeladen zu einem online Get-Together mit Prof. Dr. Isabella Gierz. Im einem Zoom Meeting gibt es die Gelegenheit, mit der Referentin ins Gespräch zu kommen und sich über weibliche Perspektiven auf Herausforderungen in Studium und Berufsleben auszutauschen.

The colloquium will be followed by a Get-Together with Prof. Dr. Isabella Gierz in Zoom (about 6 p.m.). Female students and staff are invited to talk to the speaker and discuss female perspectives on challenges in studies and professional life.

<https://tu-dresden.zoom.us/j/81965591630?pwd=eGN4VEN6NzFDV25zSkxDVndZaWlXdz09>

Meeting-ID: 819 6559 1630

Kenncode: Get!Tog1