Hybrid Inorganic/Organic Systems for Opto-Electronics

Collaborative Research Centre 951

# Colloquium Announcement

**of the Collaborative Research Centre 951**
**"Hybrid Inorganic/Organic Systems for Opto-Electronics"**

## Kirill Bolotin

Department of Physics, Freie Universität Berlin, Berlin, Germany

### In-situ functionalization of two-dimensional materials

## Emily A. Weiss

Department of Chemistry, Northwestern University, Evanston, USA

### Colloidal photocatalysis for energy conversion and organic synthesis

Time: Thursday, 22.10.2020, 15:30

Place: The colloquium takes place online (ZOOM)

Meeting-ID: 687 6163 8786
Password: 951951

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# In-situ functionalization of two-dimensional materials

**Kirill Bolotin**

*Department of Physics, Freie Universität Berlin, Berlin, Germany*

Two-dimensional materials, including monolayer transition metal dichalcogenides (TMDCs), are affected by organic molecules on their surface. Multiple physical mechanisms of such interaction have been envisioned: molecular doping, localization of excitons in TMDCs due to the presence of molecules, or "brightening" of the dark states in TMDCs. However, environmental contamination often prevents the controlled study of 2D material/molecule interface.
In this talk, I will discuss several approaches to change the chemical nature of that interface in-situ, inside our measurement setup. By studying Raman spectra and photoluminescence of 2D materials we can infer the degree of functionalization at the interface, localization of excitons, and appearance of new excitonic states.

# Colloidal photocatalysis for energy conversion and organic synthesis

**Emily A. Weiss**

*Department of Chemistry, Northwestern University, Evanston, USA*

Colloidal quantum dots (QDs) combine many of the advantages of heterogeneous and homogeneous catalysts. Their broad, intense absorption spectra and sharp emission lines also make them excellent photosensitizers for photocatalysis. But QDs can be more than photosensitizers -- their surfaces, if properly designed, can serve as templates for stereoselective organic reactions or activators of small-molecule substrates for energy conversion reactions. This talk will explore two case studies in colloidal photocatalysis: the regio- and diastereo-selective [2+2] cycloadditions of chalcone-type substrates, and the photoreduction of $CO_2$ to CO with unprecedented turnover number in pure water.