

## HL 42: Invited Talk: Claudia Draxl

Time: Tuesday 14:45–15:15

Location: EW 201

**Invited Talk**

HL 42.1 Tue 14:45 EW 201

**Excitons in organic semiconductors and organic/inorganic hybrid systems: Insight from many-body perturbation theory** — ●CLAUDIA DRAXL — Institut für Physik, Humboldt-Universität zu Berlin, Germany

Excitons are central quantities in the photophysics of materials used in opto-electronic devices. Their binding strength is governed by the degree of localization of the involved charge carriers. If the Coulomb interaction is efficiently screened, electrons and holes are free, like in metals, or form weakly bound pairs like in inorganic semiconductors. In organic molecular crystals, we find tightly bound Frenkel-type excitons with binding energies of several tens of an eV. Also low-dimensional structures, like polymer chains or carbon nanotubes exhibit strong

electron-hole interaction. New exciting phenomena can arise when two different types on materials meet in a nanostructure.

From the theoretical point of view, excitons can be studied by the solution of the Bethe-Salpeter equation within many-body perturbation theory, using density-functional theory as a starting point. I will give an introduction to this theoretical approach and demonstrate with several examples the above described effects. They will comprise polymers and organic materials as well as valence and core excitations in inorganic semiconductors. Finally, I will discuss the optical absorption of a new "peapod", a hybrid material formed by organic molecules encapsulated in semiconducting carbon nanotubes. I will demonstrate that the two constituents, though being, purely van-der-Waals bound, interact in the excited state by forming hybrid excitons.