"Many-body perturbation theory: from molecular adsorbates to paired nanotubes"

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Many-body perturbation theory (MBPT) describes excited electronic states (electron and hole states from GW calculations, and excitons from the Bethe-Salpeter equation). In here, one key ingredient to exchange-correlation is given by the dielectric screening within and between condensed matter. MBPT applies equally well to extended and molecular systems, to metallic and non-metallic materials, allowing to investigate systems of reduced dimensions or hybrid systems, e.g. molecules on metals.
After a general overview I will discuss recent developments based on model dielectric functions, which are computationally highly efficient and allow to study much larger systems than before. Two examples are the electronic spectrum of PTCDA adsorbed on the Ag(111) surface, which exhibits a Kondo resonance, and the optical spectra of coupled carbon nanotubes, which show characteristic red-shifts.

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