Abstract for seminar talk 27.11.2025

Water-dispersed Conjugated Polymer Nanoparticles for Energy Conversion

Organic semiconductors offer the possibility to harness solar light to generate or store energy. Yet, their hydrophobic nature typically requires the use of toxic solvents for their processing. Post-synthesis techniques can enable the dispersion of any organic semiconductor as nanoparticles (NPs) in water, without altering their properties. This communication highlights the versatility of such approach, and how it directly translates in the field of energy conversion.

Water-processed solar cells recently achieved power conversion efficiencies above 10% and opens the door to new alternatives for greener organic photovoltaics (OPV). The impact of the nanoparticle preparation can directly affect the efficiency but also processability of the resulting solar cells. Therefore, they must be properly understood to harness the full potential of water-based OPV.

Beyond photovoltaics, polymer NPs can serve as nanoreactors once dispersed in water for photocatalytic reactions. By tailoring nanoparticle characteristics (crystallinity, intermixing, permeability), remarkable activity for photocatalytic hydrogen production can be achieved. Building on this knowledge, future advances may further improve the stability and cost-effectiveness of polymer-based photocatalysts.