TRANSIENT ABSORPTION SPECTROSCOPY

Chair of Soft Matter Optoelectronics (EP II)

4. Evaluation

4.1 UV-VIS spectroscopy

a) Plot and discuss the observed bands in the ZnTPP and P3HT absorption spectra using appropriate literature.
b) Plot and compare the spectra of ZnTPP solution in benzonitrile and toluene. What is the origin of the spectral shift that occurs?
c) Plot and compare the UV-VIS spectra of the three zinc complexes (ZnTPP, Zn4PP and ZnOEP) and comment on their suitability for the transient absorption spectroscopy experiments.

4.2 Transient absorption spectroscopy

Graphically represent the recorded transient absorption (TA) data. Determine the lifetime of the triplet state by fitting a suitable function to the TA signal.

a) Compare the lifetimes in samples with different concentrations and discuss the trends that occur, also in relation to the expectations that follow the theory.
b) Compare the lifetimes of samples 1 and 5-7 and discuss the trends that occur, also in relation to the expectations that follow the theory.
c) From the lifetimes of samples 1 and 5-7, reaction rates can be determined. By plotting these against the concentration of C_{70}, the desired reaction rate of the quenching process k_q can be determined. Compare your result with the literature.
d) What is the effect of solvent change on the TA signal (maximum value and lifetime) of ZnTPP solutions. Comment on the correlation between the change in lifetime with the spectral shift observed in different solvents (4.1.c).
e) The TA signal of P3HT differs significantly from that of ZnTPP. What is the underlying process of P3HT?
f) Explain the occurring (maximum) TA signals of the three zinc complexes (0.8 mM in benzonitrile) considering the UV-VIS spectra of the complexes.
g) Discuss the influence of the pump laser pulse width on the TA signal.