Supporting Information

Synthesis and optical properties of covalently bound Nile Red in mesoporous silica hybrids - Comparison of dye distribution of materials prepared by facile grafting and by co-condensation routes.

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1. Structural characterization of grafted and cocondensed materials 6 and 7

1.1. Nitrogen sorption measurements

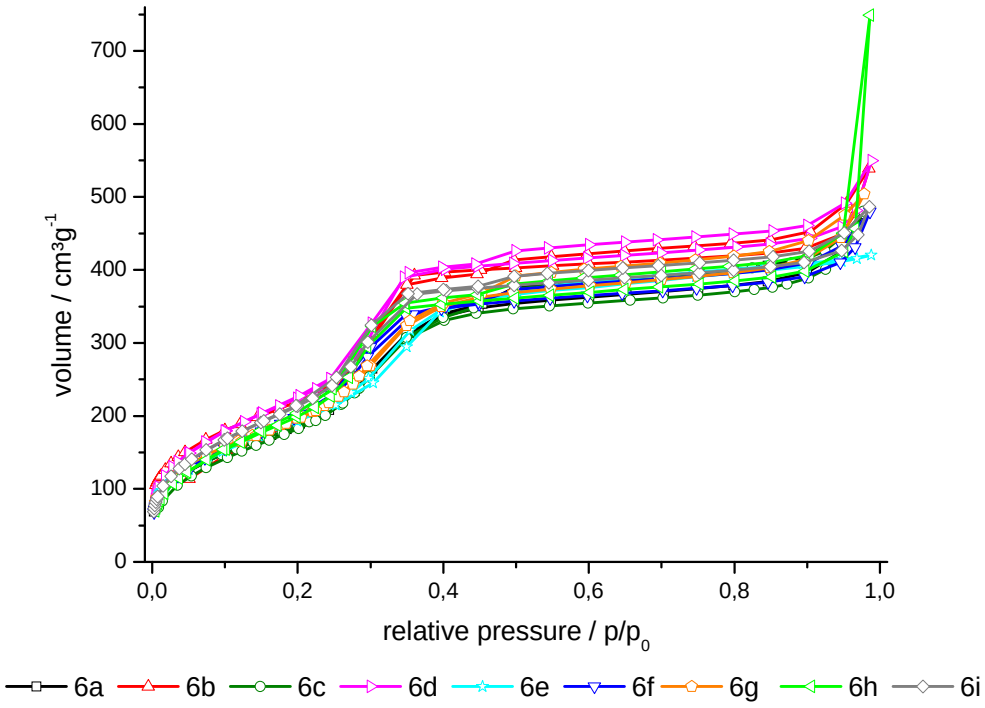

Figure S 1: Nitrogen sorption isotherms of grafted samples **6**. The deep adsorption increase of hybrid **6h** at relative pressures close to the saturation pressure is attributed to nitrogen condensation in interparticle voids.

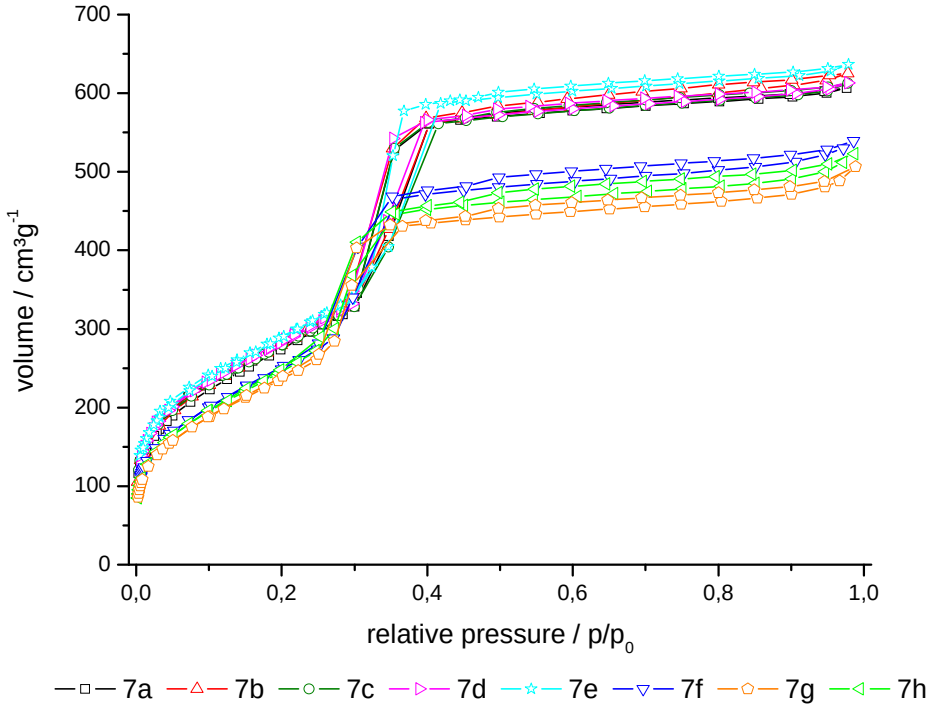

Figure S 2: Nitrogen sorption isotherms of co-condensed samples **7**.

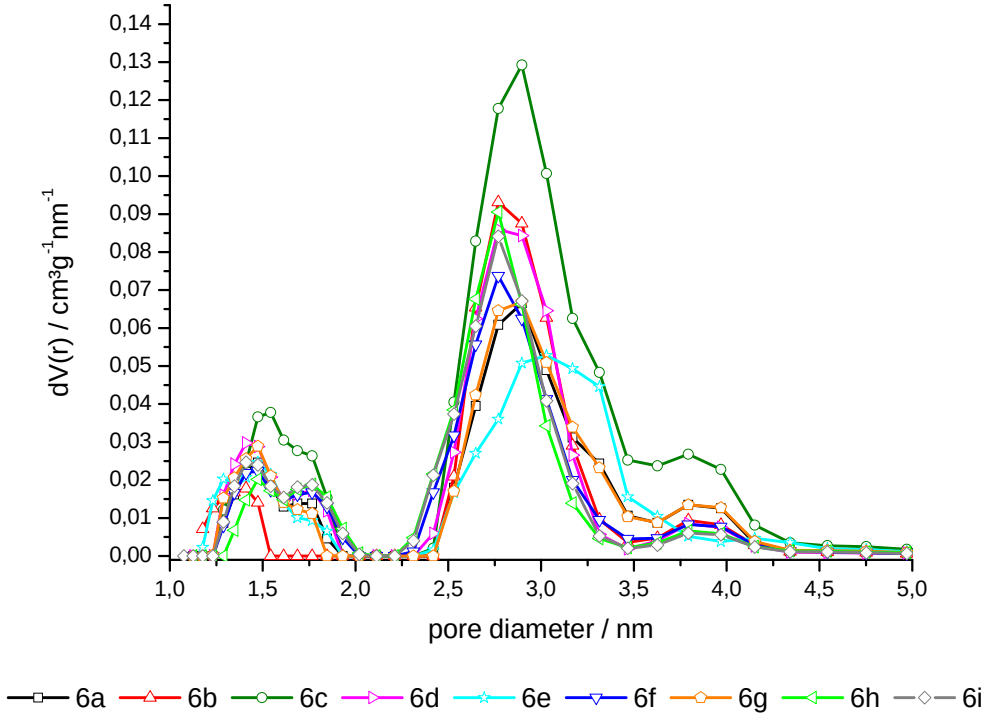

Figure S 3: pore size distribution curves of grafted samples **6**.

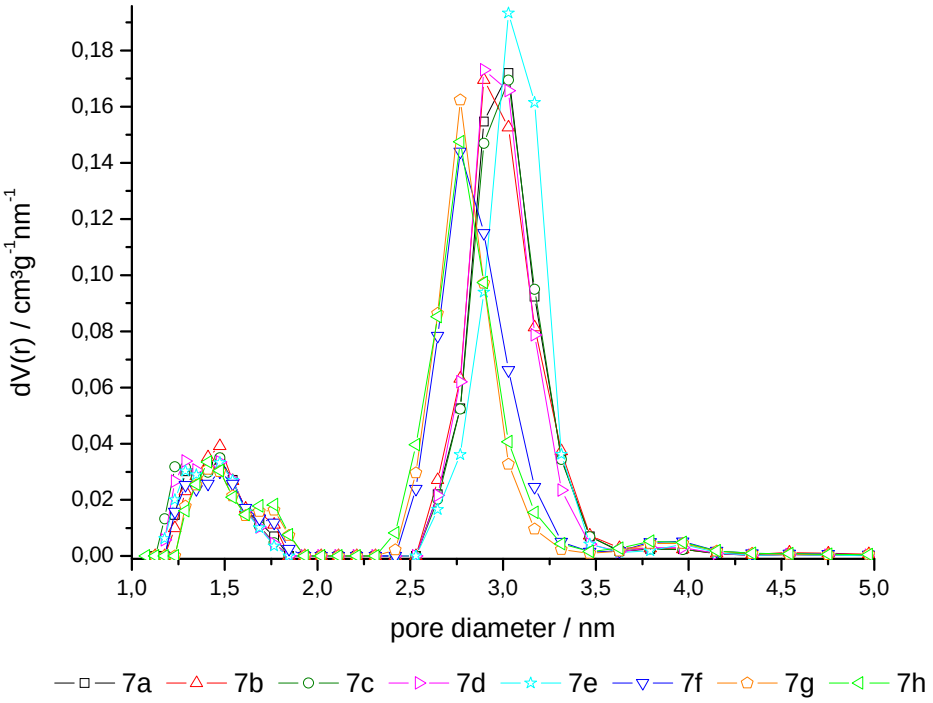

Figure S 4: pore size distribution curves of co-condensed samples **7**.

1.2. Small angle x-ray scattering (SAXS)

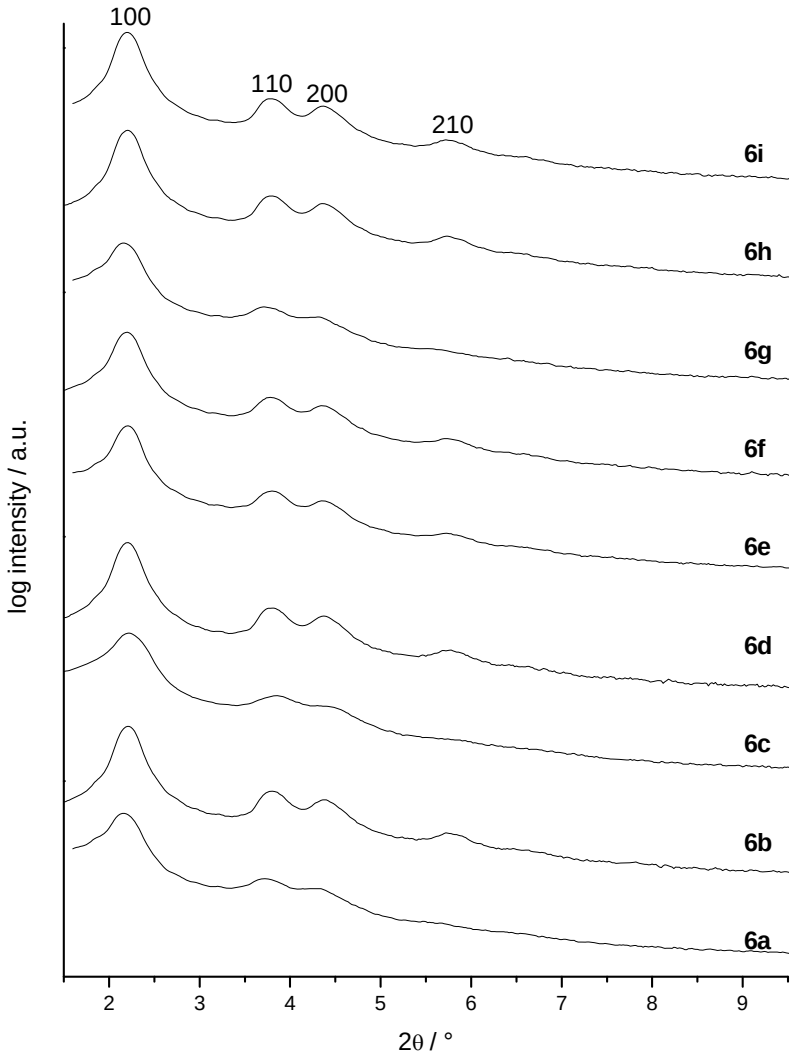

Figure S 5: SAXS pattern of grafted samples **6**.

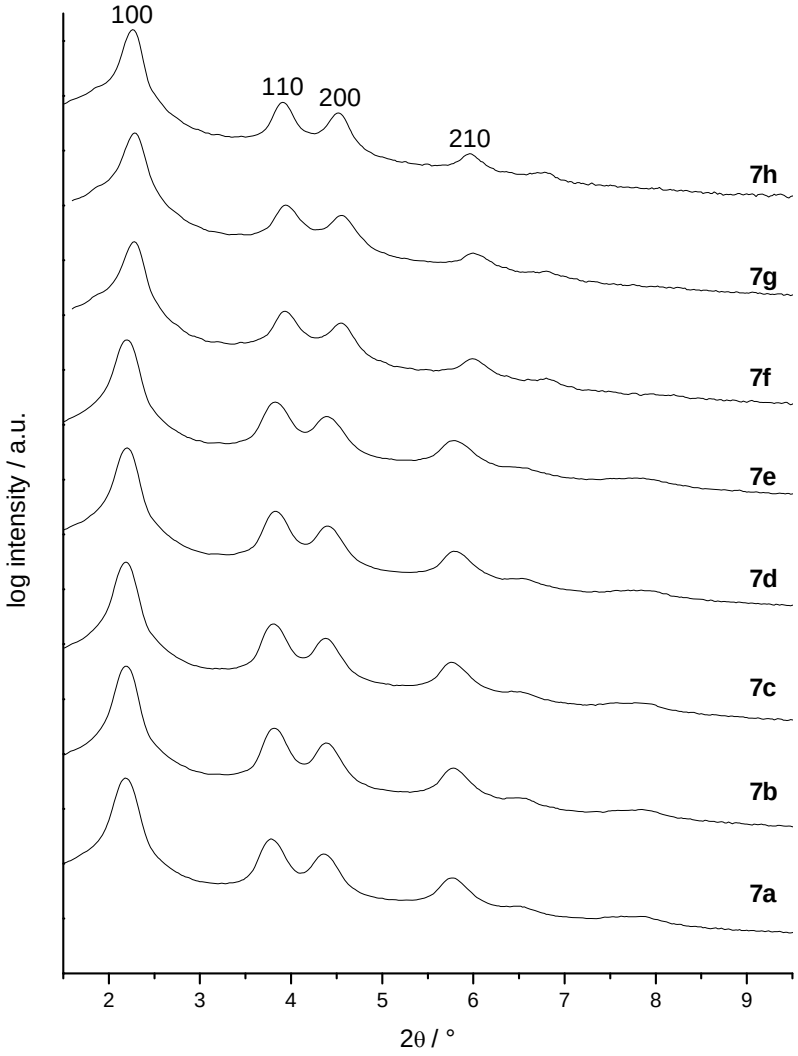

Figure S 6: SAXS pattern of co-condensed samples **7**.

1.3. Transmission electron microscopy (TEM)

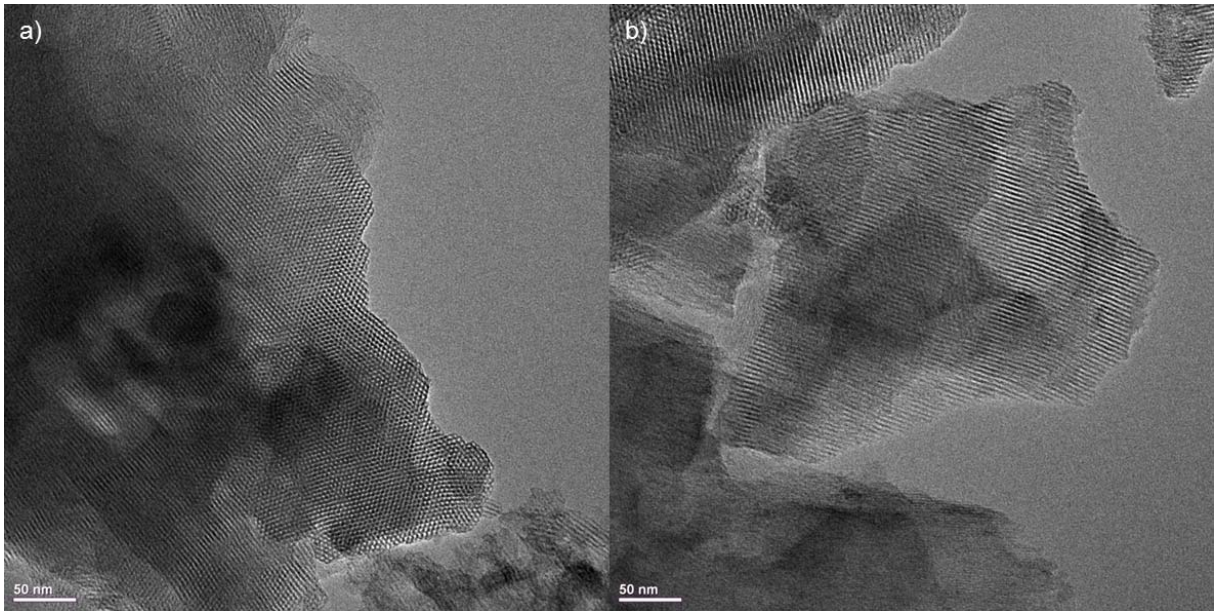

Figure S 7: TEM images of **6a** a) along the channel direction and b) perpendicular to the channel direction.

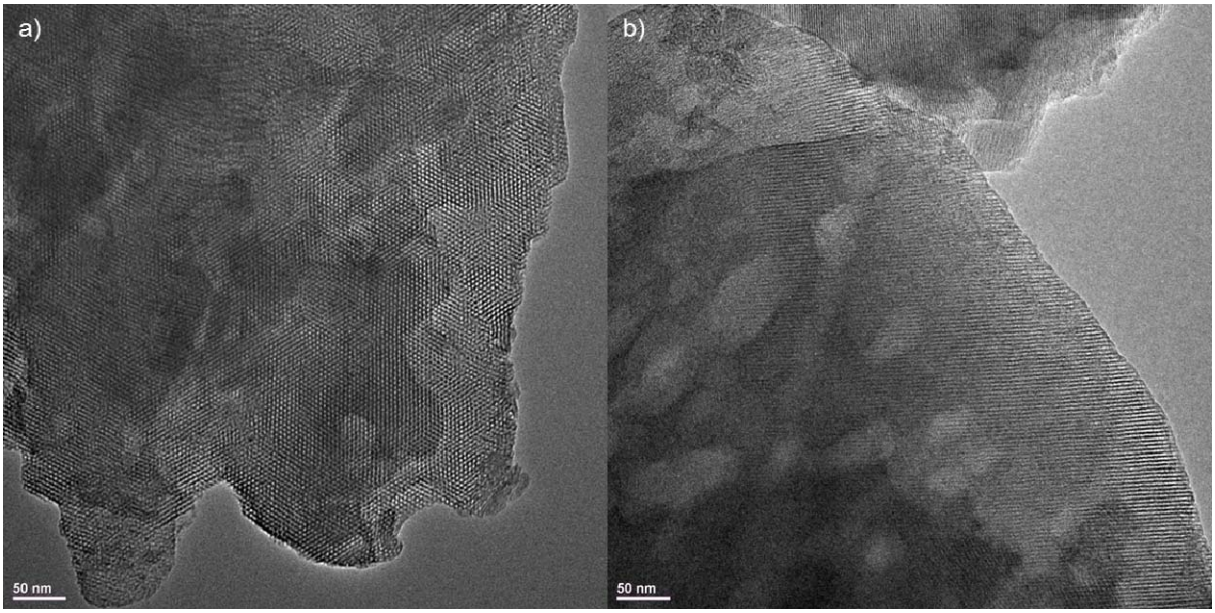

Figure S 8: : TEM images of **6b** a) along the channel direction and b) perpendicular to the channel direction.

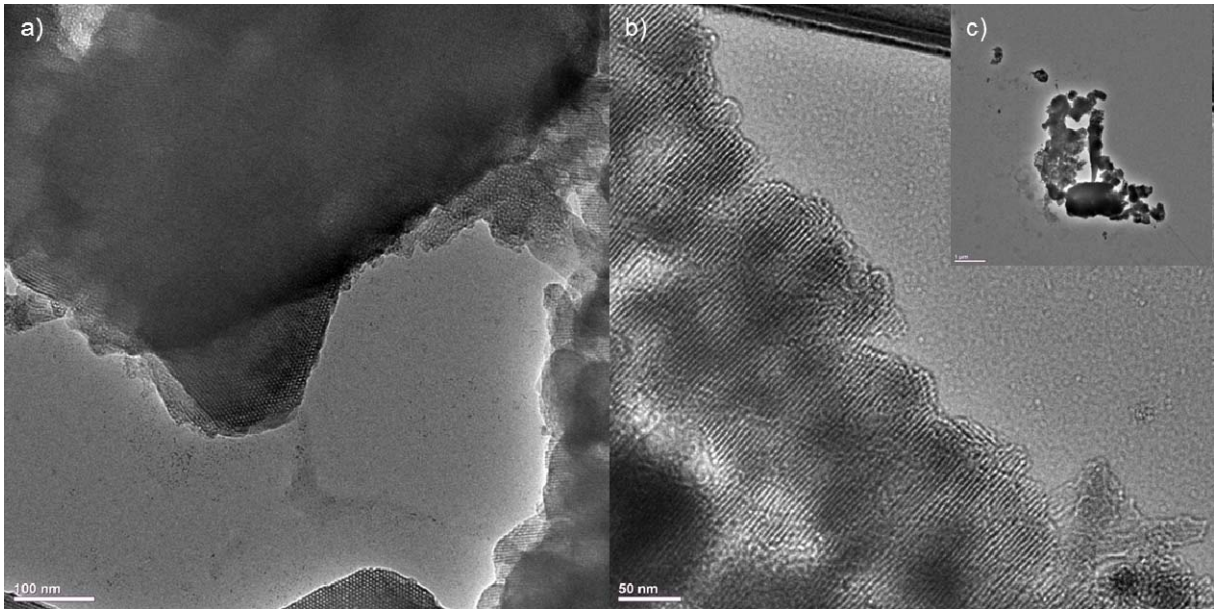

Figure S 9: TEM images of **6c** a) along the channel direction, b) perpendicular to the channel direction and c) large scale.

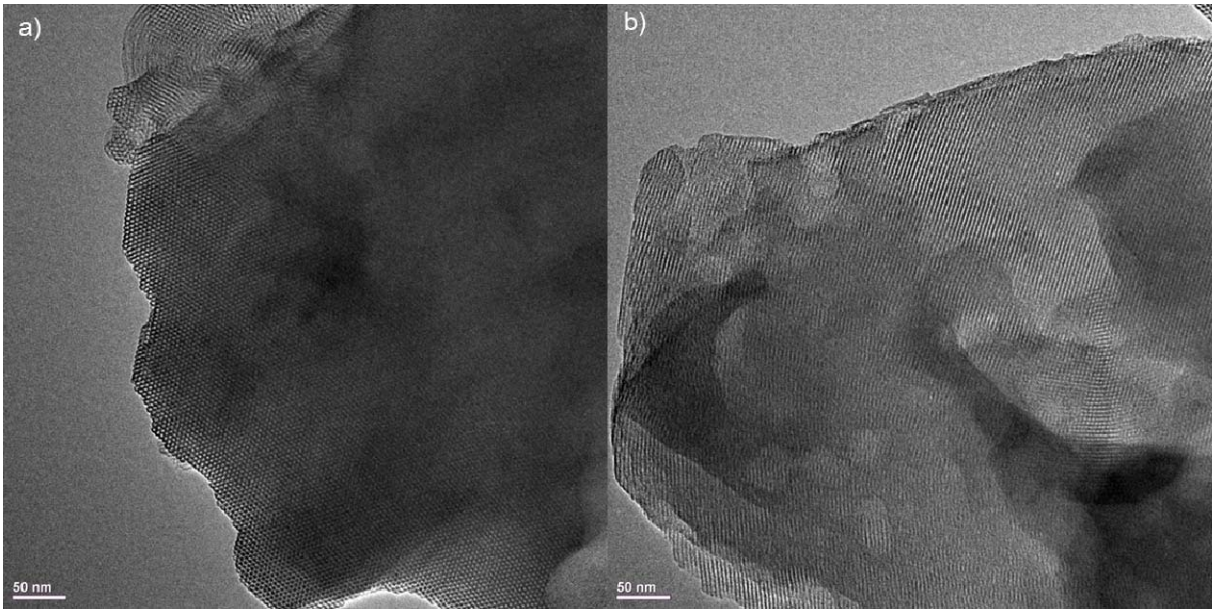

Figure S 10: TEM images of **6d** a) along the channel direction and b) perpendicular to the channel direction**.**

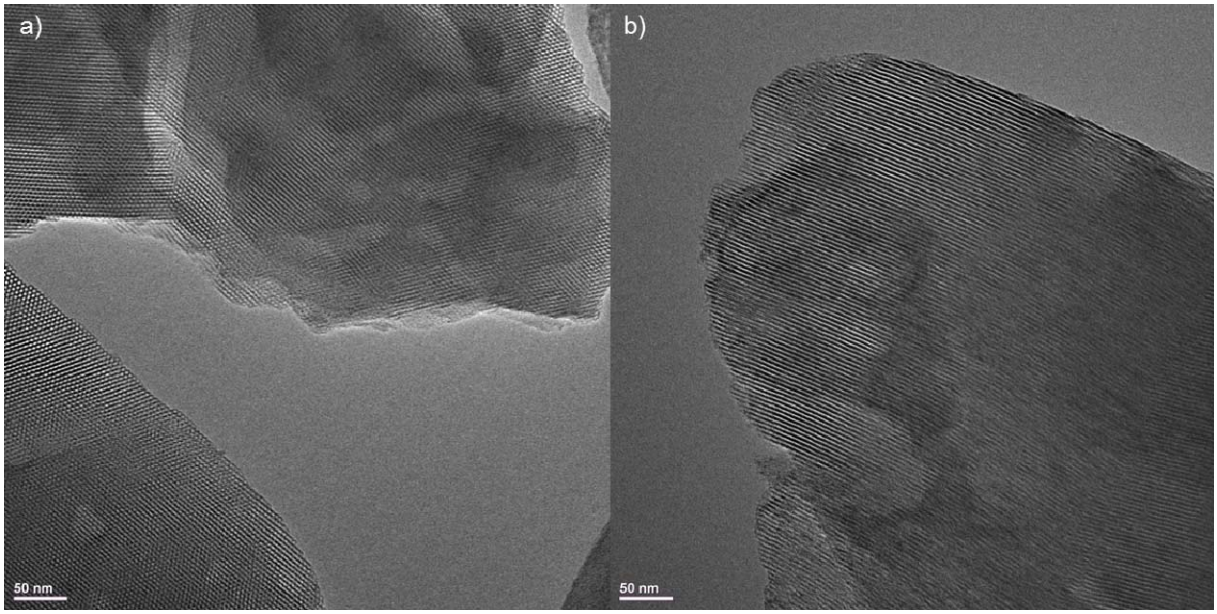

Figure S 11: TEM images of **6e** a) along the channel direction and b) perpendicular to the channel direction.

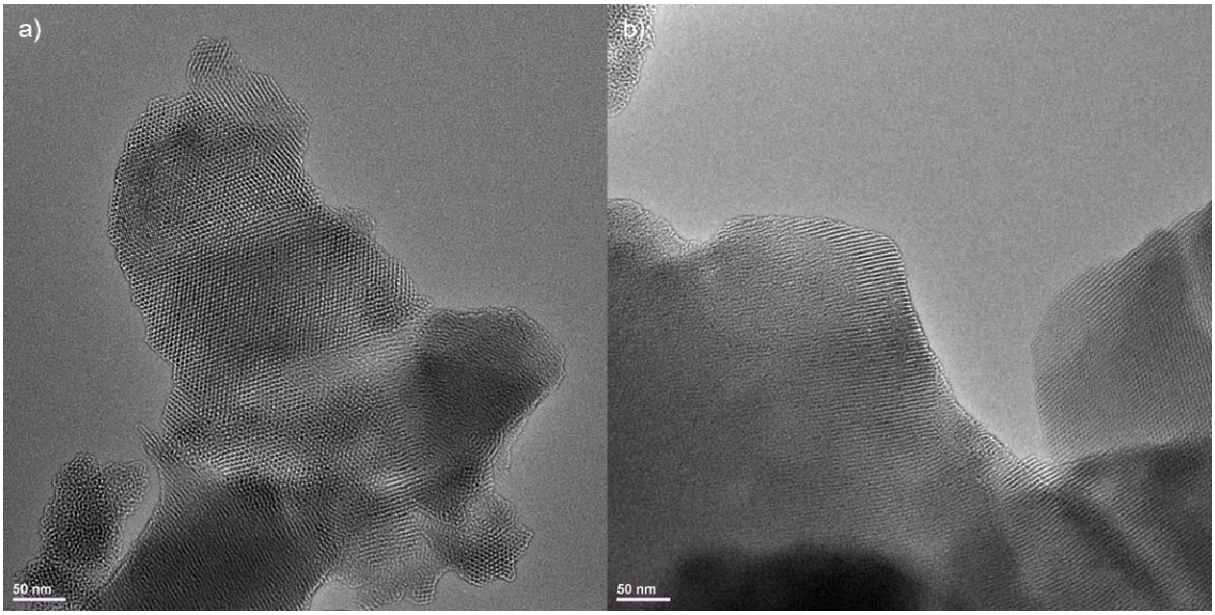

Figure S 12: TEM images of **6f** a) along the channel direction and b) perpendicular to the channel direction.

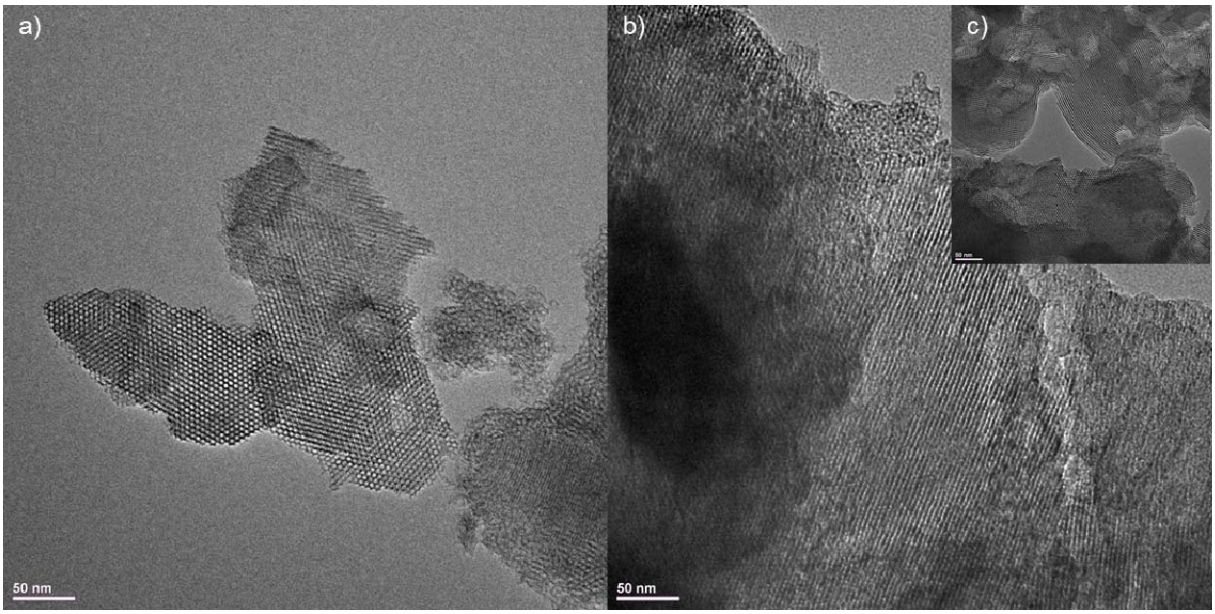

Figure S 13: TEM images of **6g** a) along the channel direction, b) perpendicular to the channel direction and c) mixed phase.

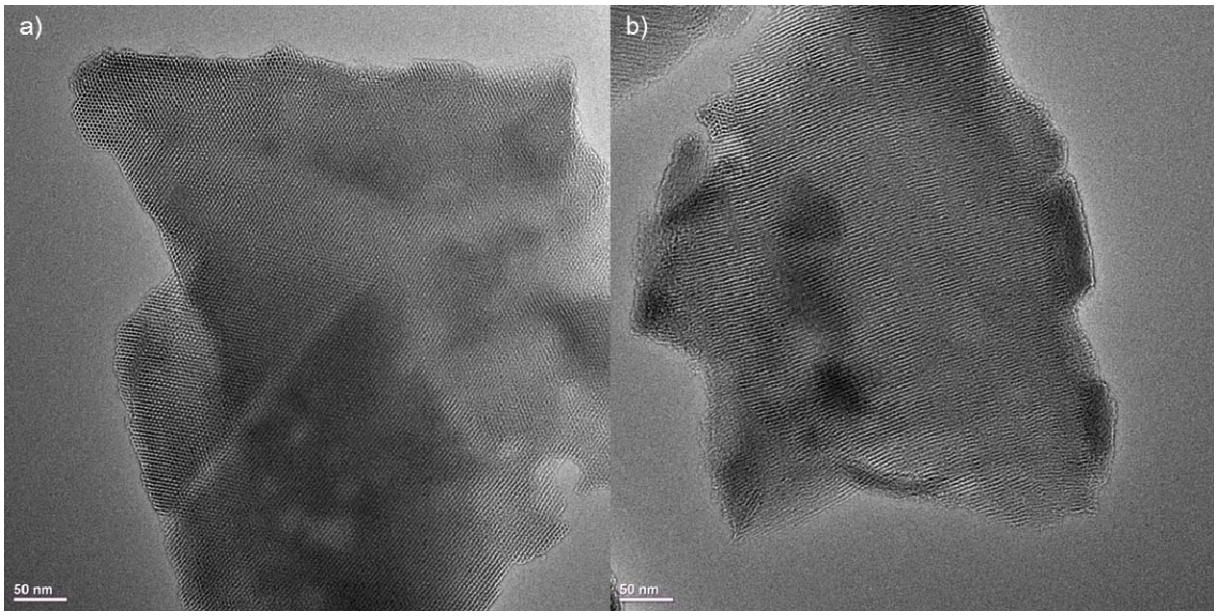

Figure S 14: TEM images of **6h** a) along the channel direction and b) perpendicular to the channel direction.

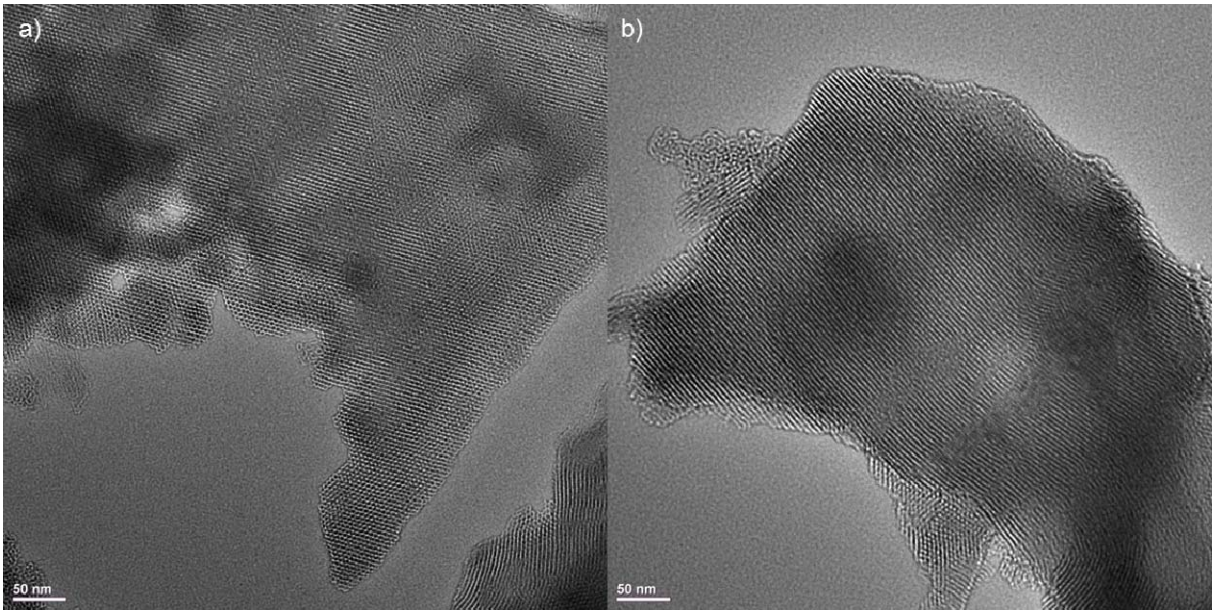

Figure S 15: TEM images of **6i** a) along the channel direction and b) perpendicular to the channel direction.

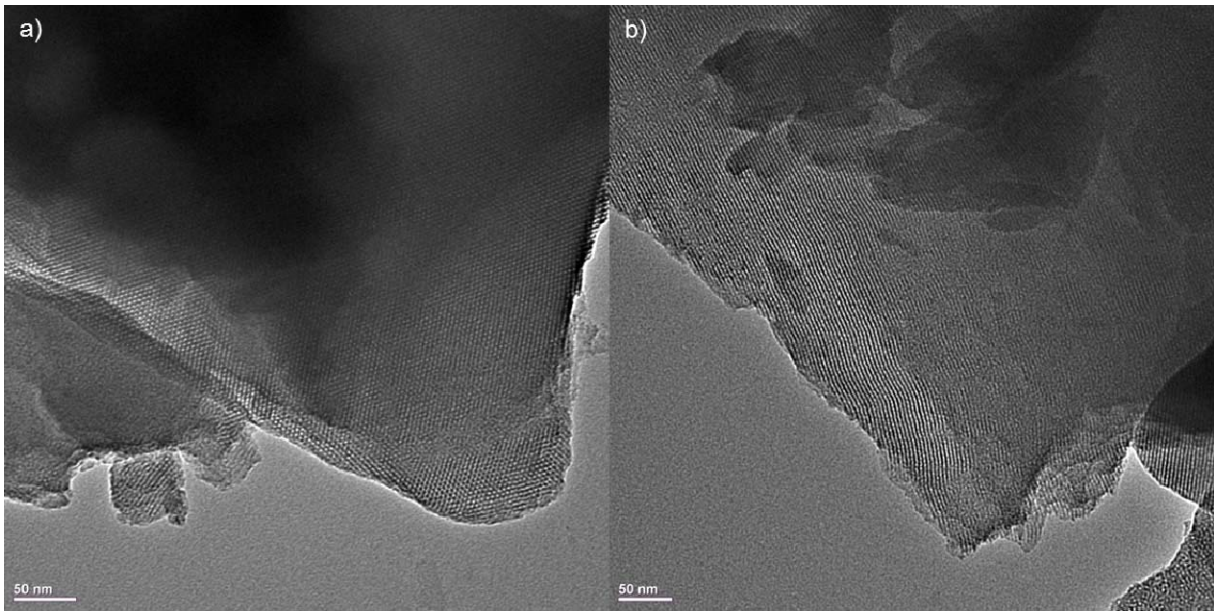

Figure S 16: TEM images of **7a** a) along the channel direction and b) perpendicular to the channel direction.

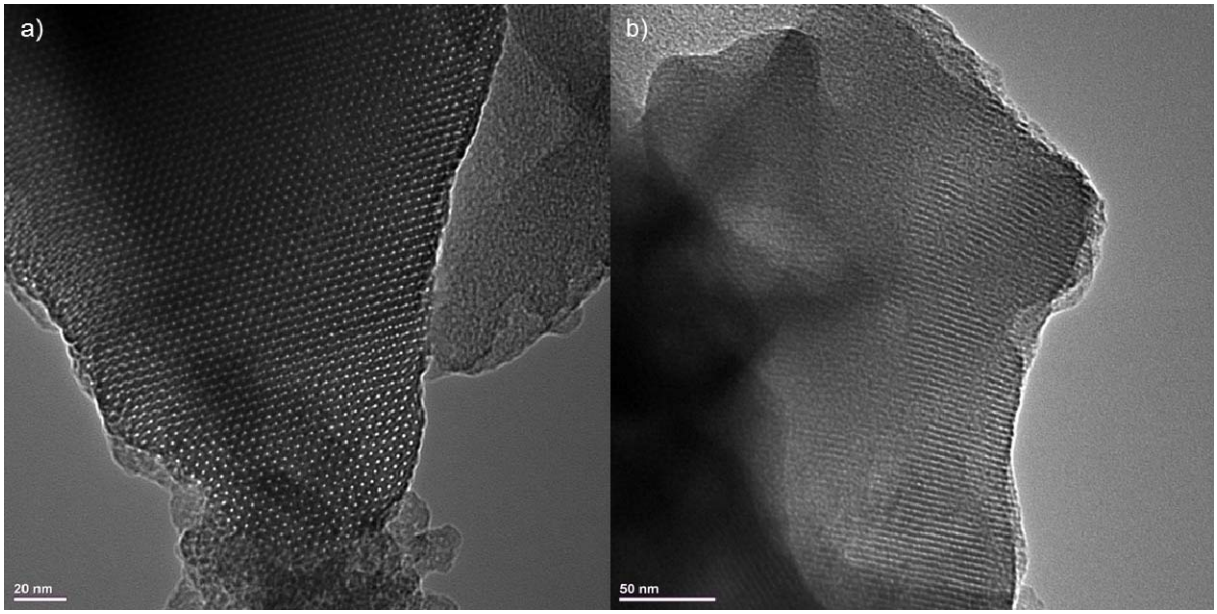

Figure S 17: TEM images of **7b** a) along the channel direction and b) perpendicular to the channel direction.

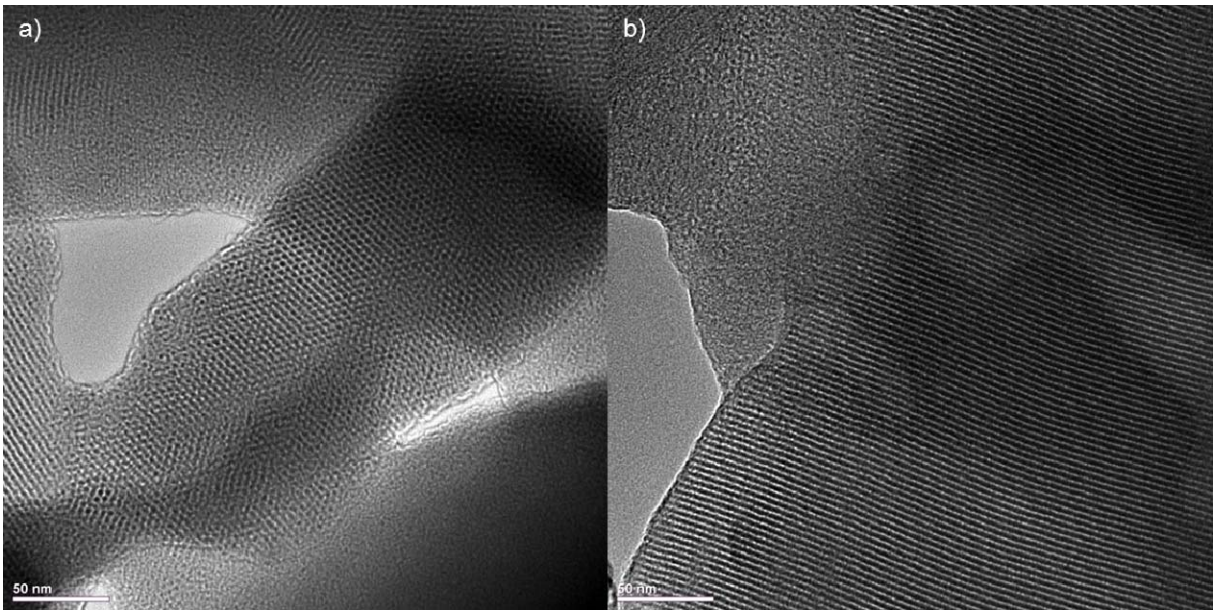

Figure S 18: TEM images of **7c** a) along the channel direction and b) perpendicular to the channel direction.

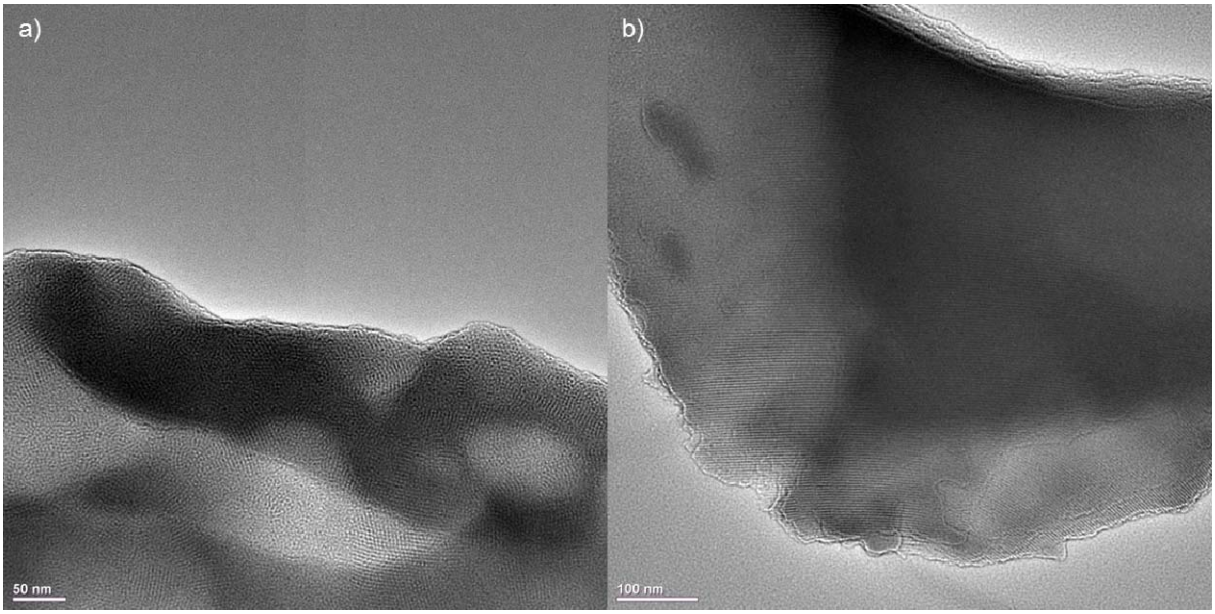

Figure S 19: TEM images of **7d** a) along the channel direction and b) perpendicular to the channel direction.

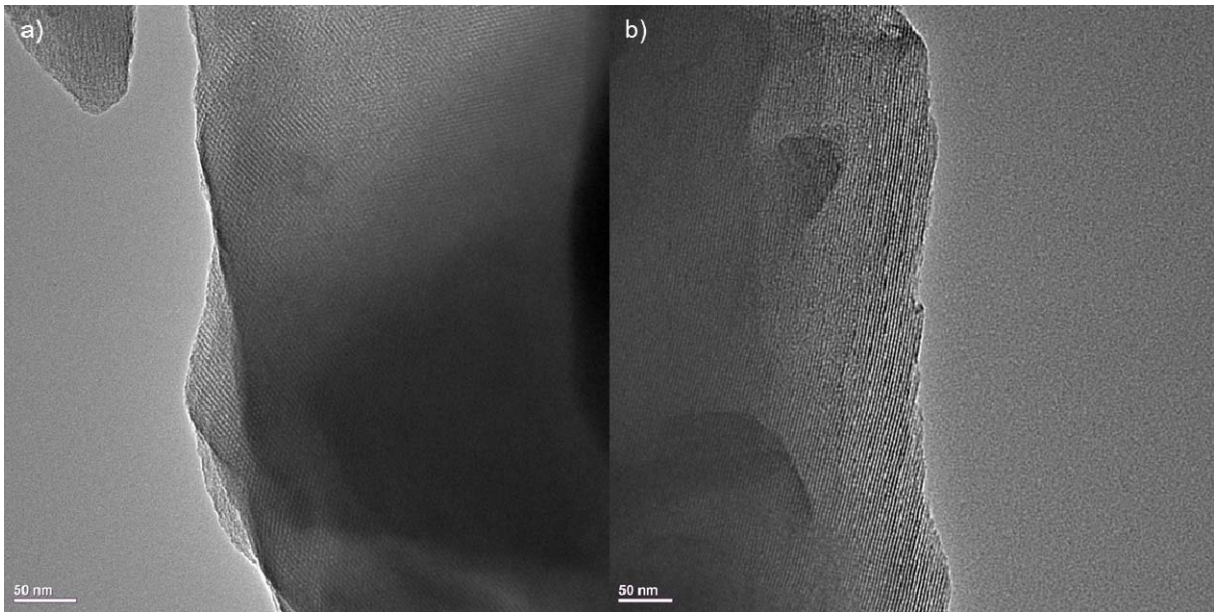

Figure S 20: TEM images of **7e** a) along the channel direction and b) perpendicular to the channel direction.

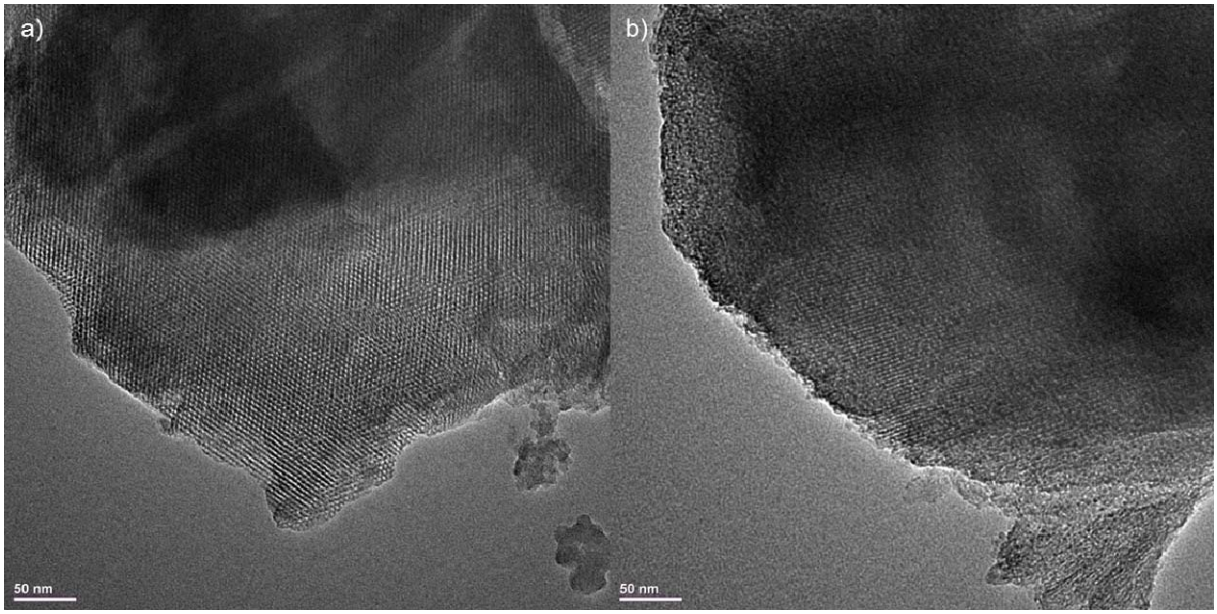

Figure S 21: TEM images of **7f** a) along the channel direction and b) perpendicular to the channel direction.

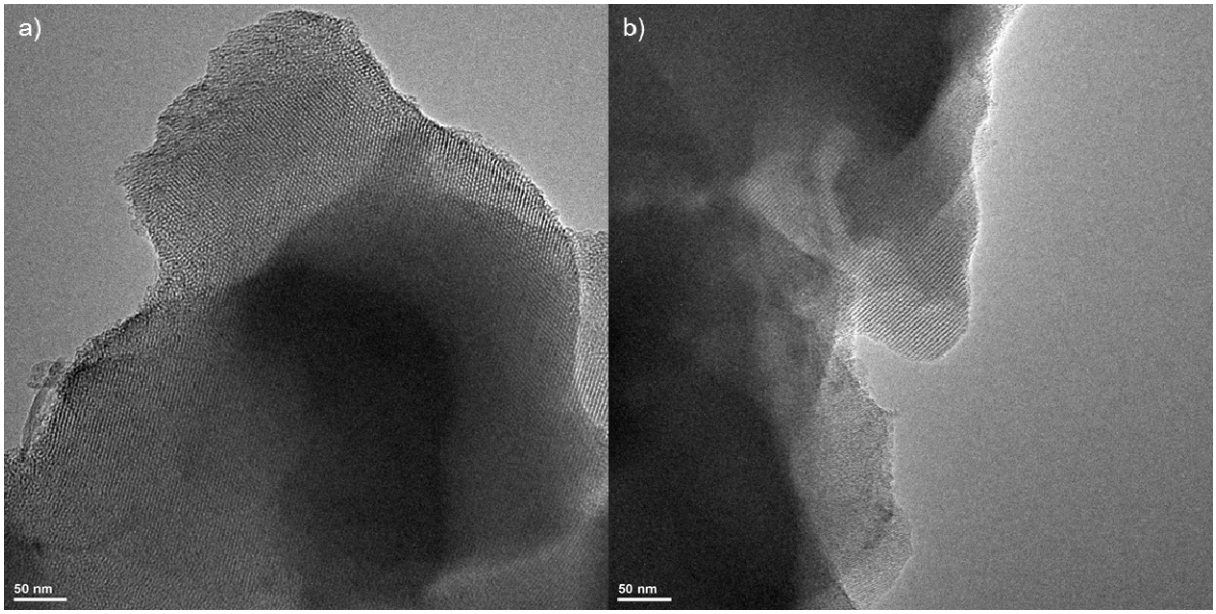

Figure S 22: TEM images of **7g** a) along the channel direction and b) perpendicular to the channel direction.

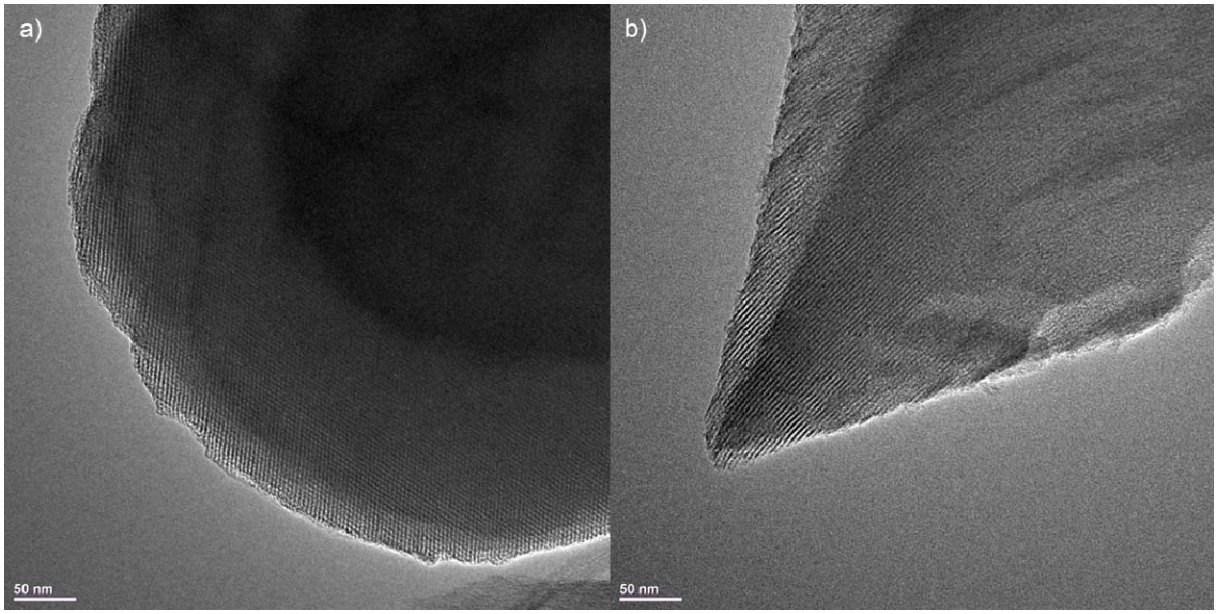

Figure S 23: TEM images of **7h** a) along the channel direction and b) perpendicular to the channel direction.

2. Spectroscopic properties of precursor 5, and hybrid materials 6 and 7

2.1. Solvatochromism of precursor 5

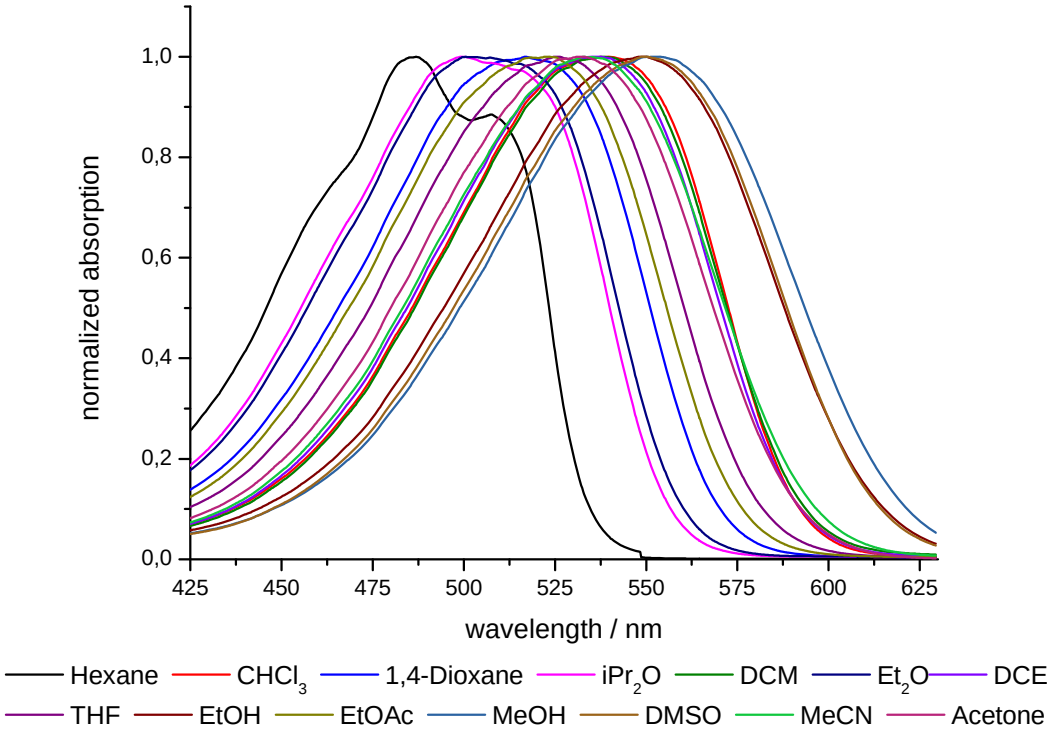

Figure S 24: Absorption spectra of **5** in different solvents.

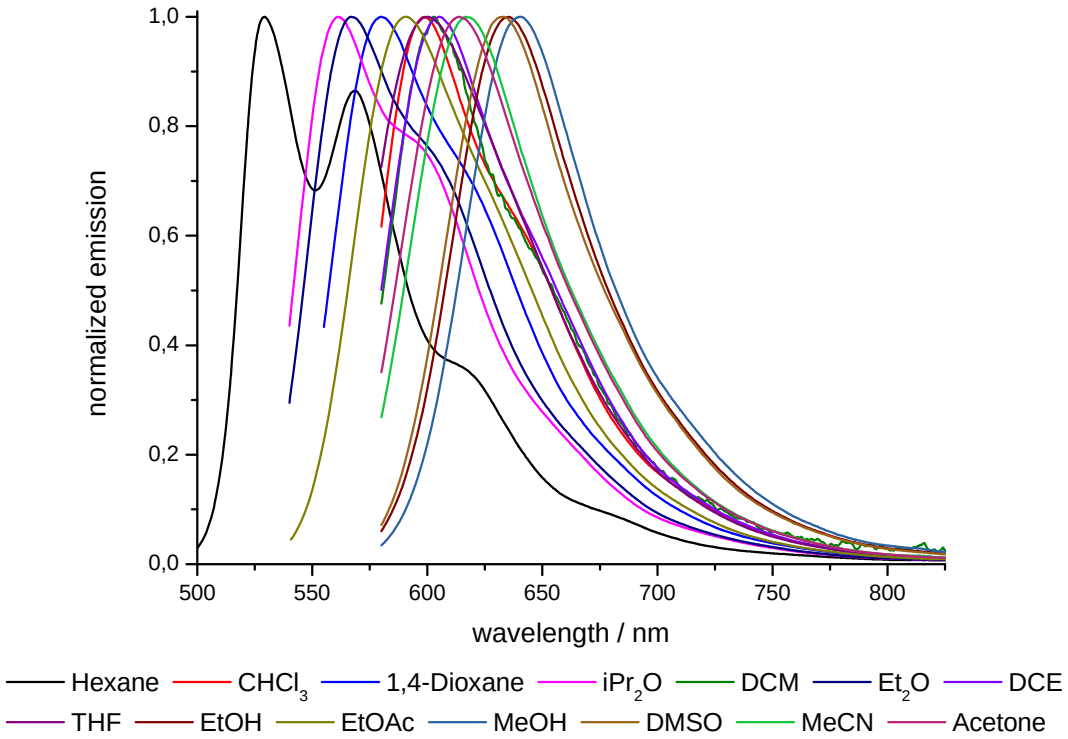

Figure S 25: Emission spectra of **5** in different solvents.

The molar extinction coefficient of precursor **5** in DMSO was determined to be ε_{539nm} = 21000 $M^{-1}cm^{-1}$.

2.2. Determination of dye concentration inside materials 6 and 7

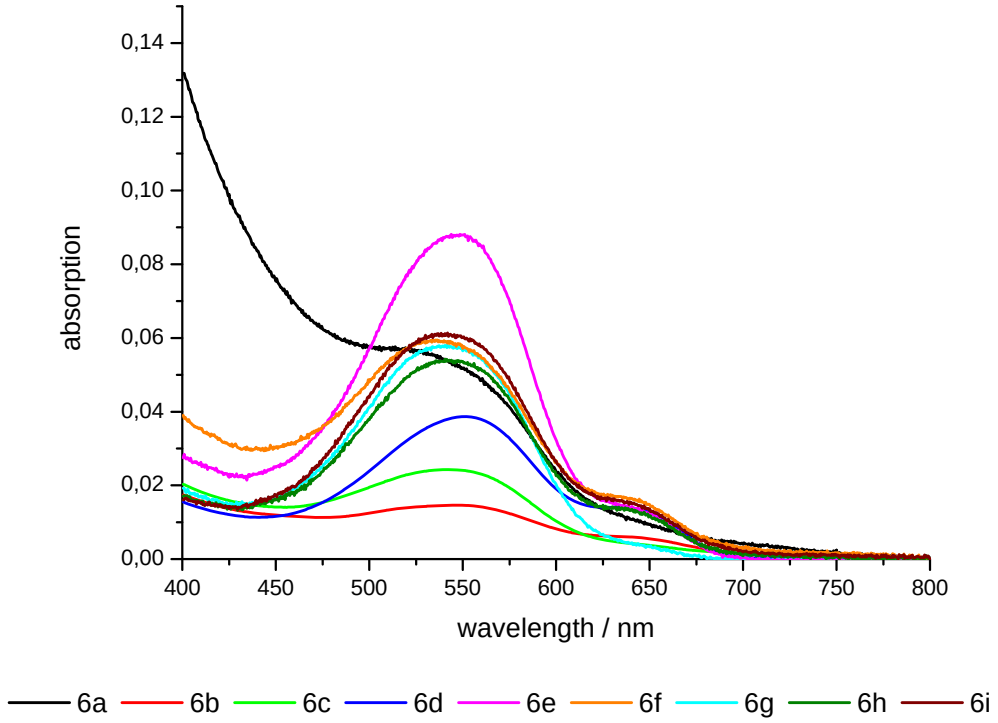

Figure S 26: UV/Vis-spectra of grafted hybrid materials suspended in DMSO with c(**6a**) = 3.0 g/L, c(**6b**-**6g**) = 0.3 g/L, c(**6h**) = 0.15 g/L, c(**6i**) = 0.12 g/L.

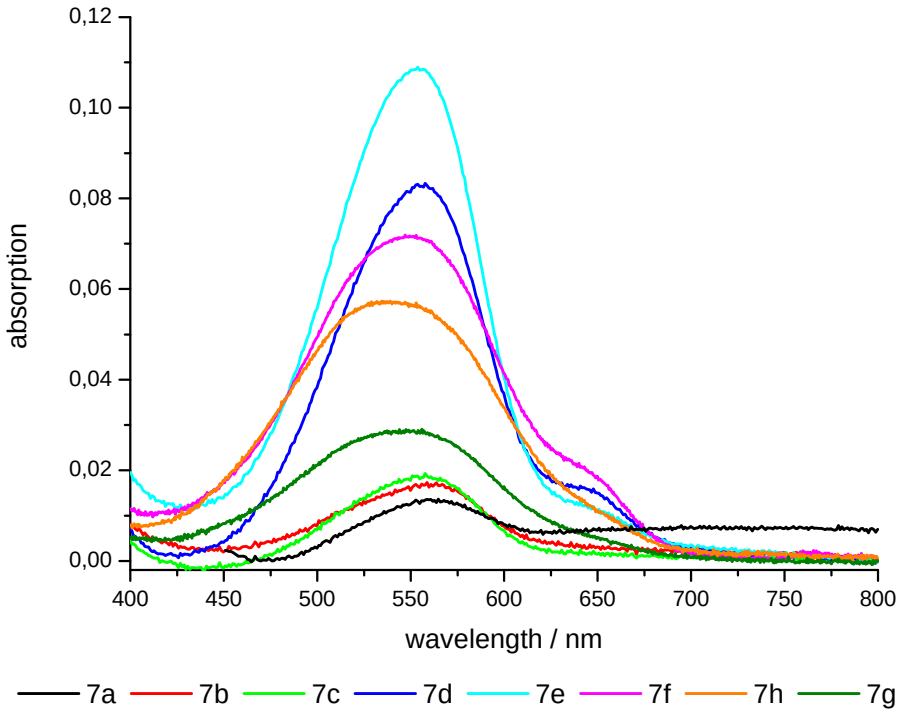

Figure S 27: UV/Vis-spectra of co-condensed hybrid materials suspended in DMSO with c(**7a**) = 10 g/L, c(**7b** - **7e**) = 3.0 g/L, c(**7f**) = 0.30 g/L, c(**7g**) = 0.075 g/L, c(**7h**) = 0.060 g/L.

2.3. Solvatochromism of hybrid materials 6 and 7

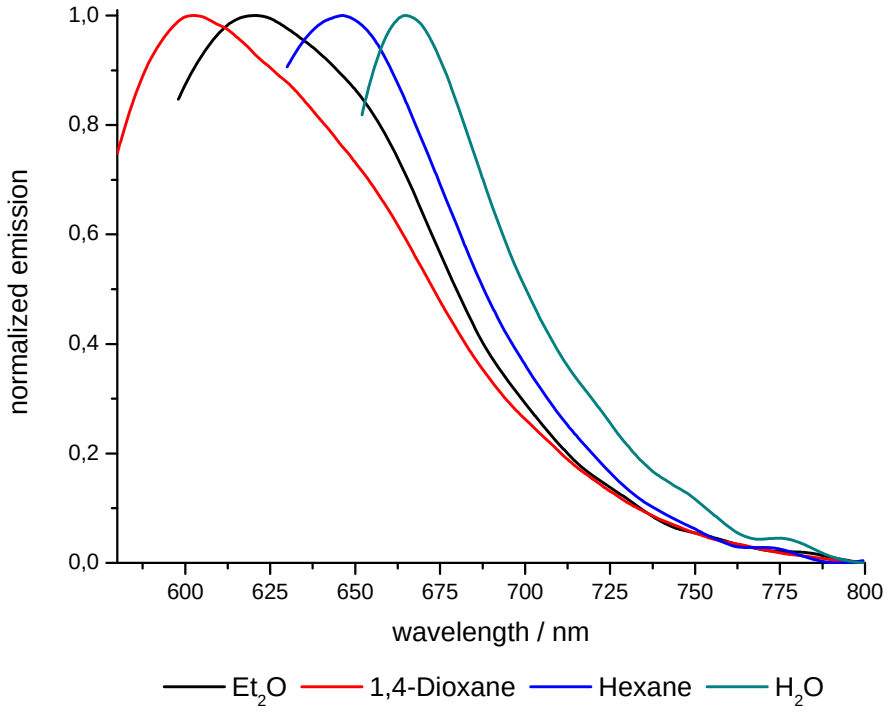

Figure S 28: normalized emission spectra of **6b** in different solvents.

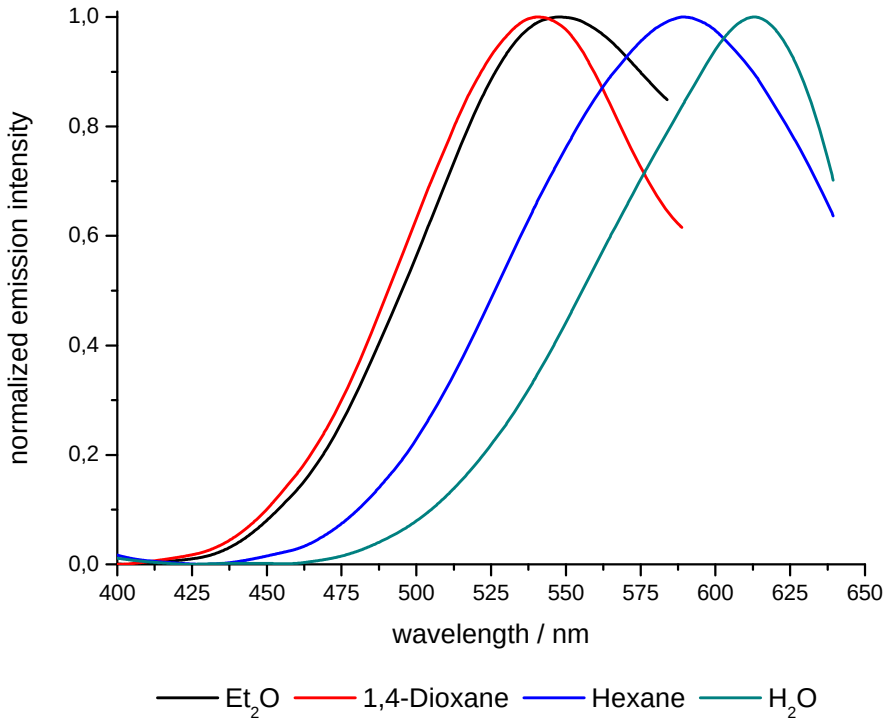

Figure S 29: normalized excitation spectra of **6b** in different solvents ($\lambda_{emission}$ = 660 nm).

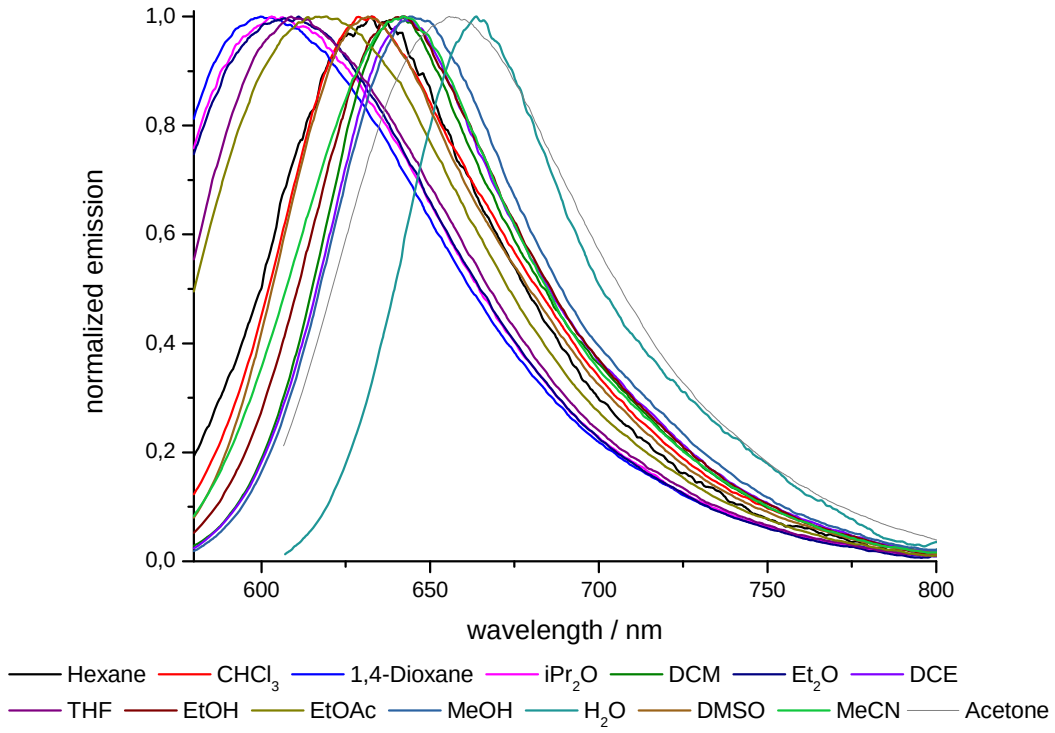

Figure S 30: normalized emission spectra of **7e** in different solvents.

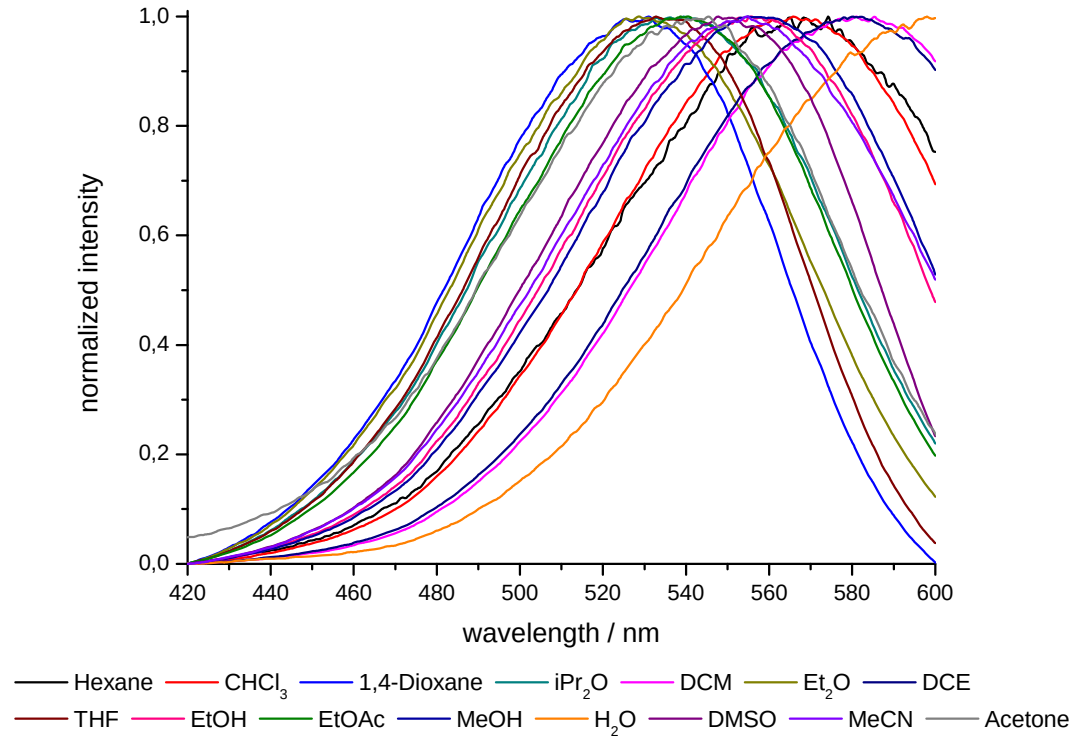

Figure S 31: normalized excitation spectra of **7e** in different solvents ($\lambda_{emission}$ = 650 nm).

2.4. Excitation and emission spectra of hybrid materials 6 and 7 in the solid state

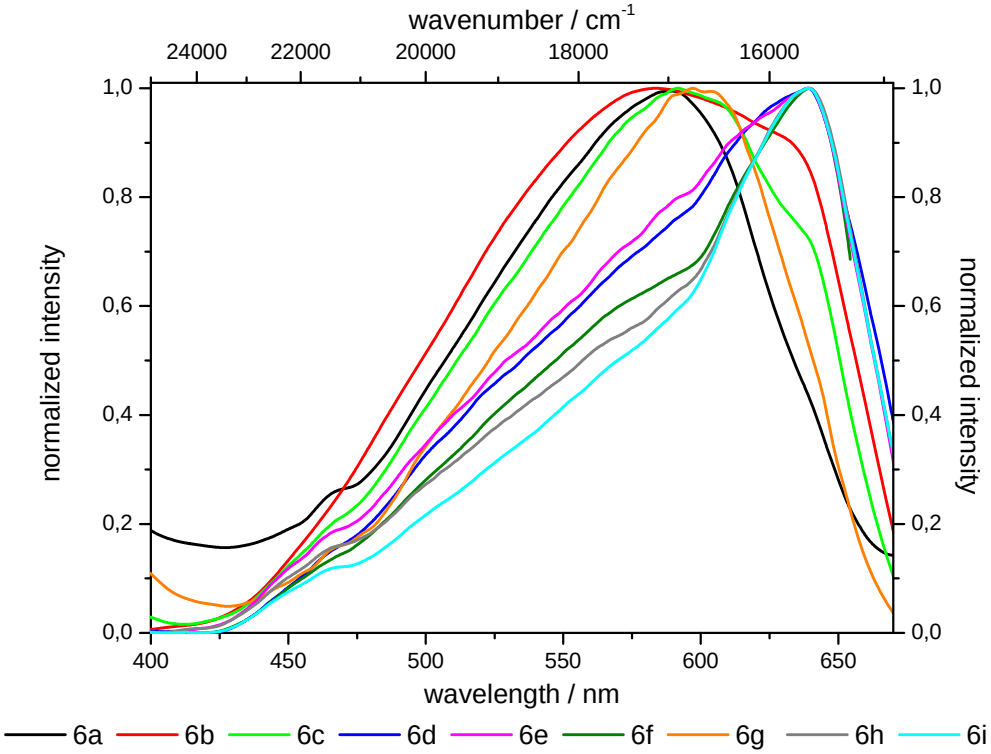

Figure S 32: normalized excitation spectra of grafted hybrid materials **6** ($\lambda_{emission}$ = 700 nm).

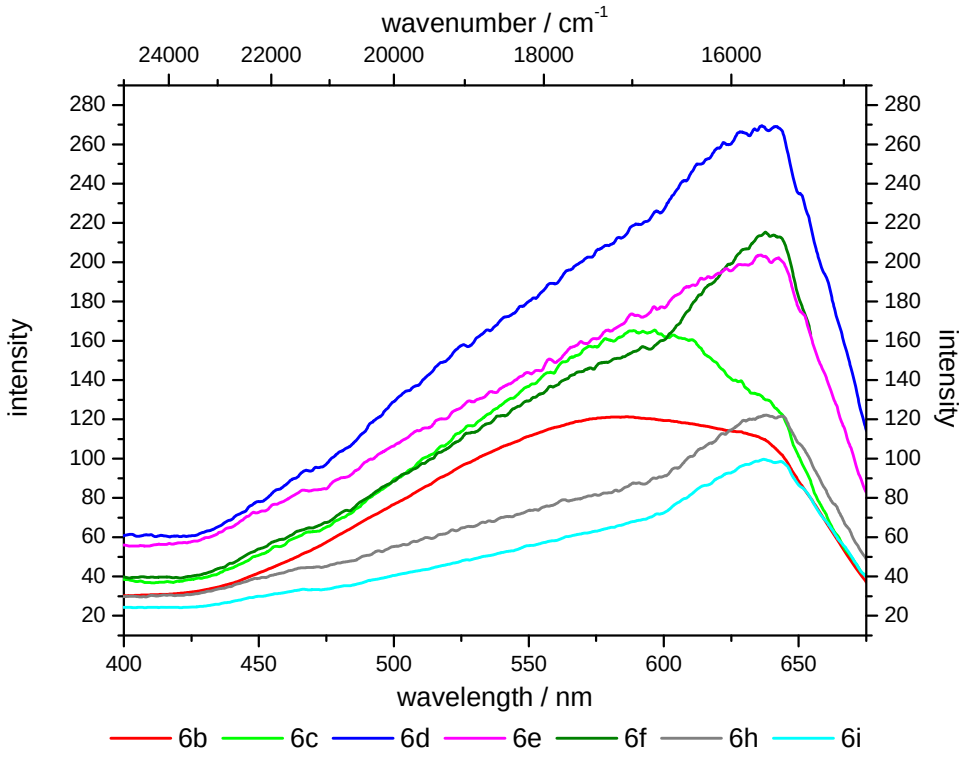

Figure S 33: excitation spectra of grafted hybrid materials **6** ($\lambda_{emission}$ = 700 nm). (Hybrid materials **6a** and **6g** not shown as they were measured in another setup.)

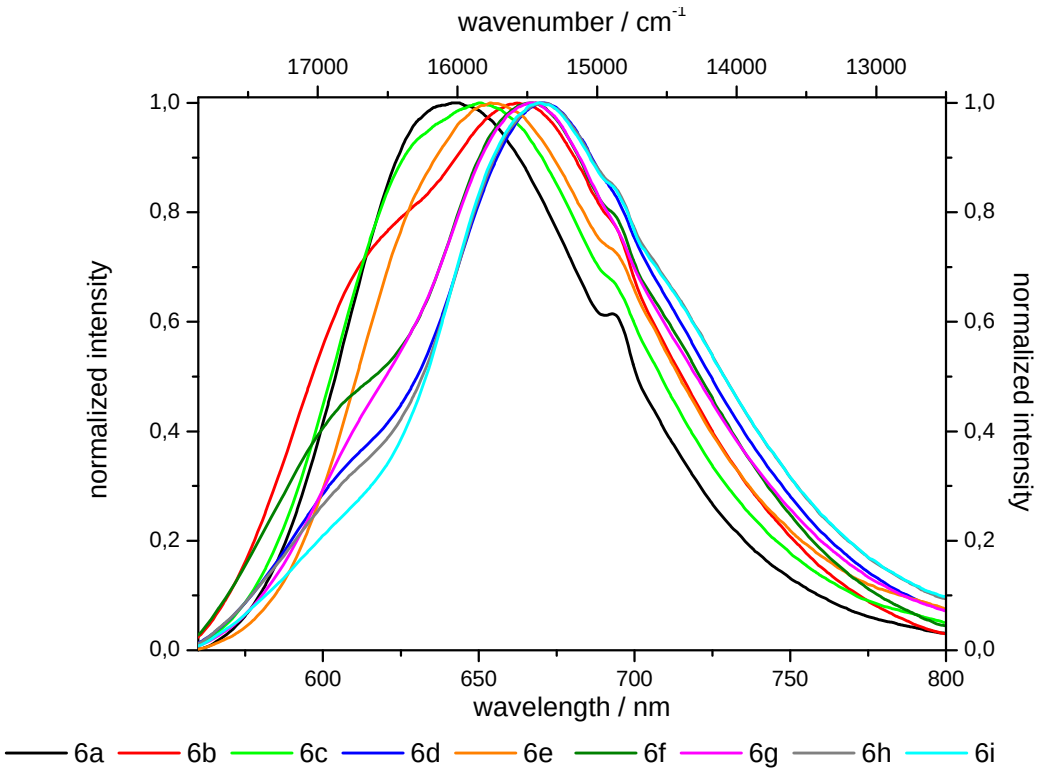

Figure S 34: normalized emission spectra of grafted hybrid materials **6**.

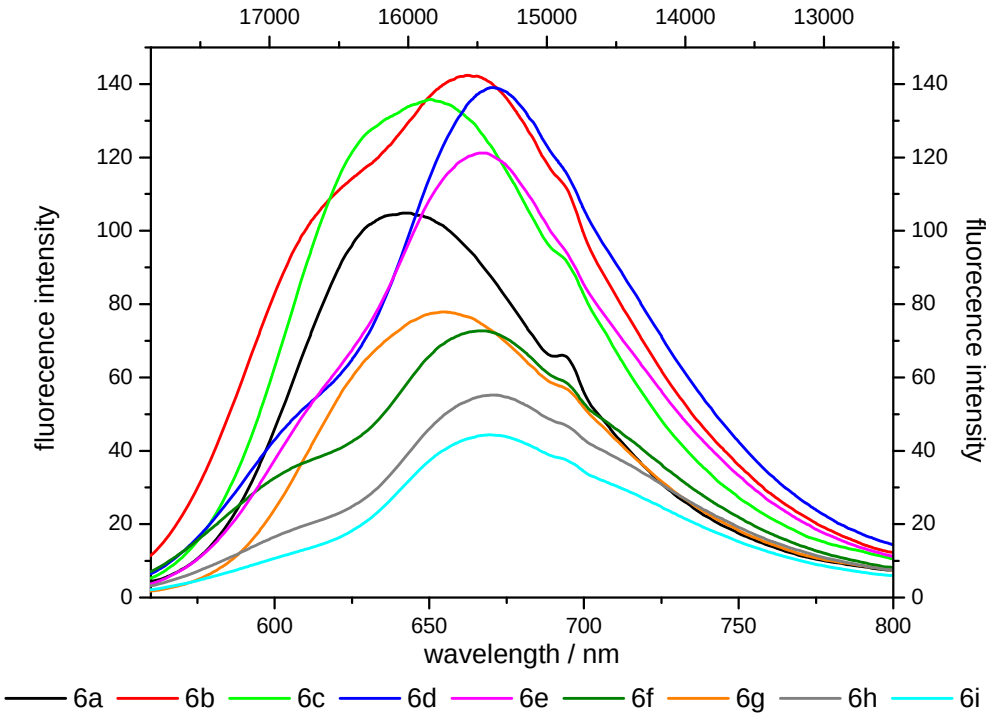

Figure S 35: emission spectra of grafted hybrid materials **6**.

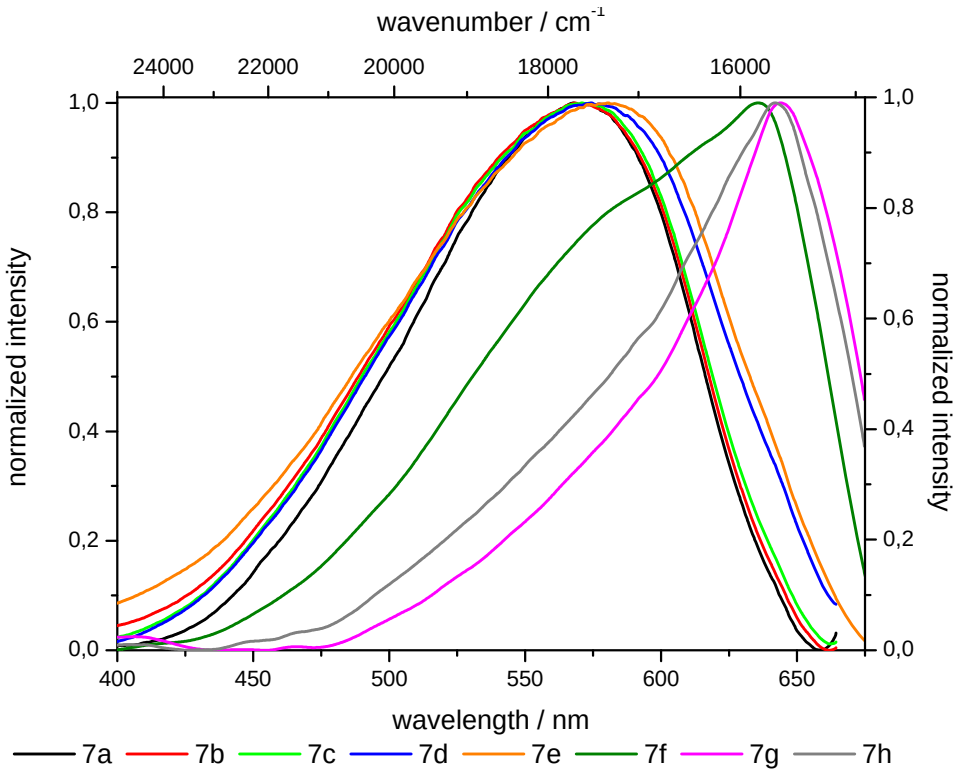

Figure S 36: normalized excitation spectra of co-condensed hybrid materials **7** ($\lambda_{emission}$ = 700 nm).

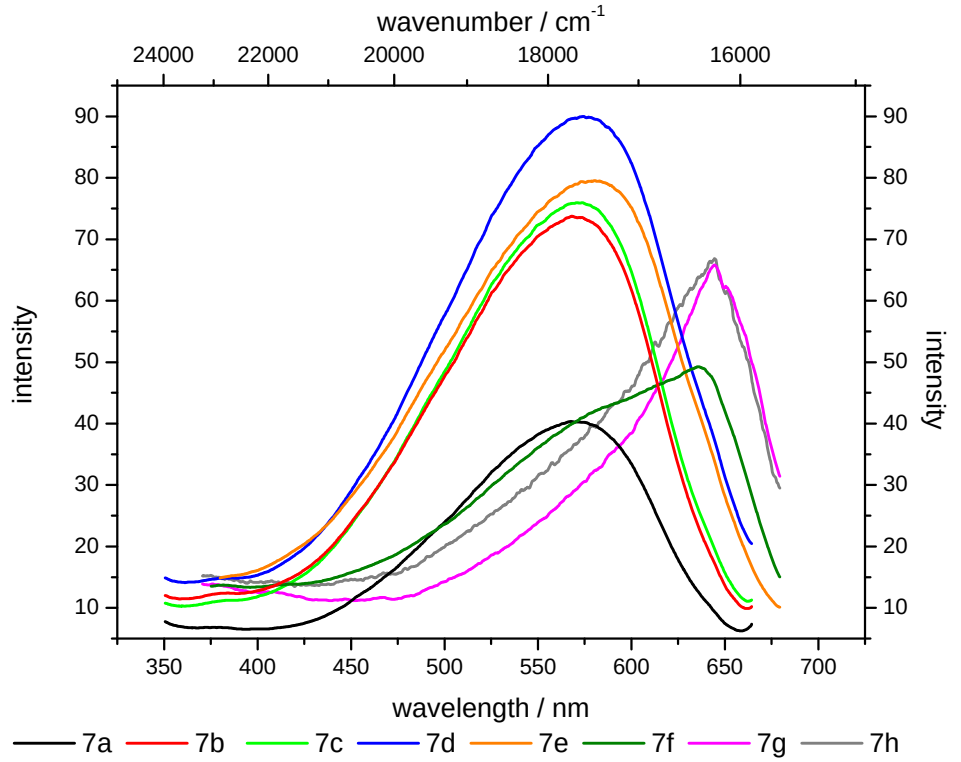

Figure S 37: excitation spectra of co-condensed hybrid materials **7** ($\lambda_{emission}$ = 700 nm).

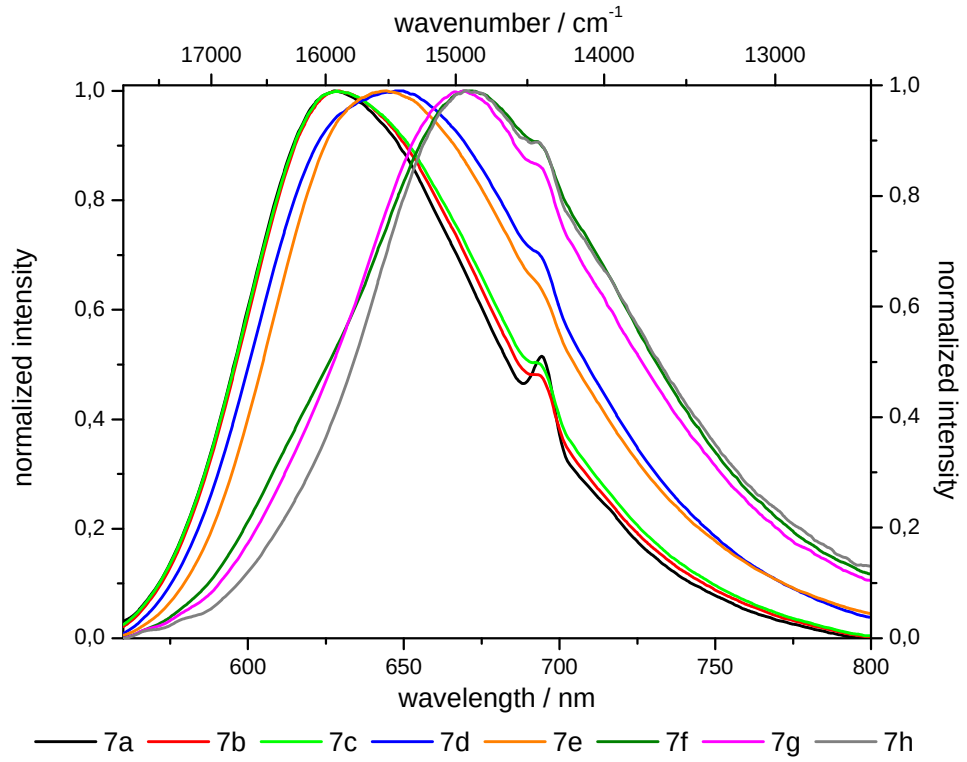

Figure S 38: normalized emission spectra of co-condensed hybrid materials **7**.

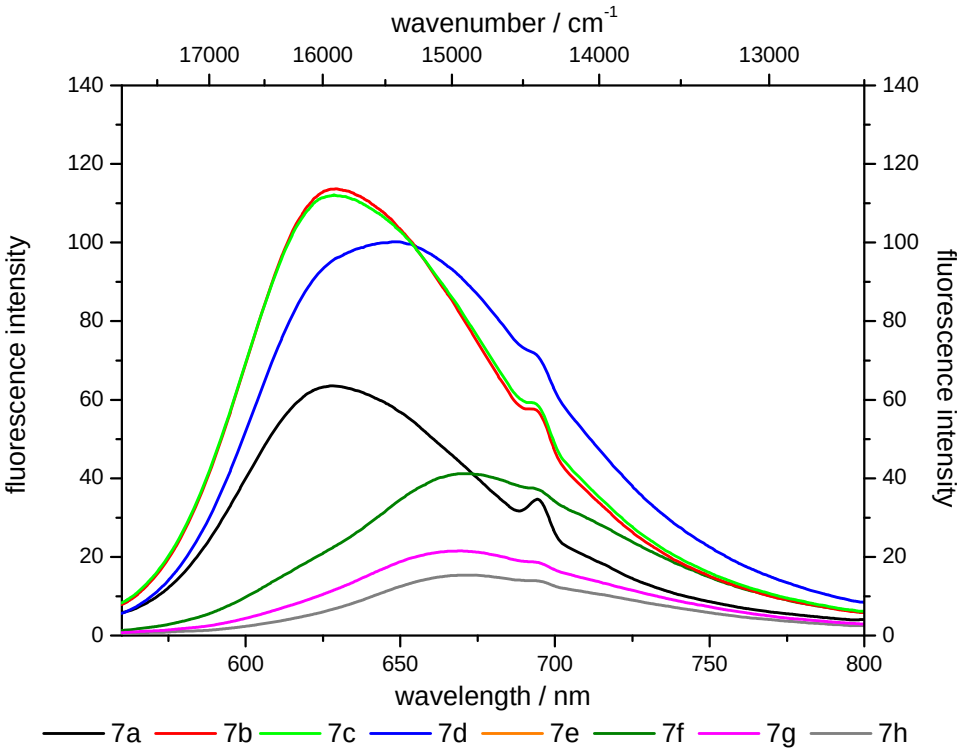

Figure S 39: emission spectra of co-condensed hybrid materials **7**.

2.5. Red-edge excitation shift (REES) of hybrid materials 6b and 7e

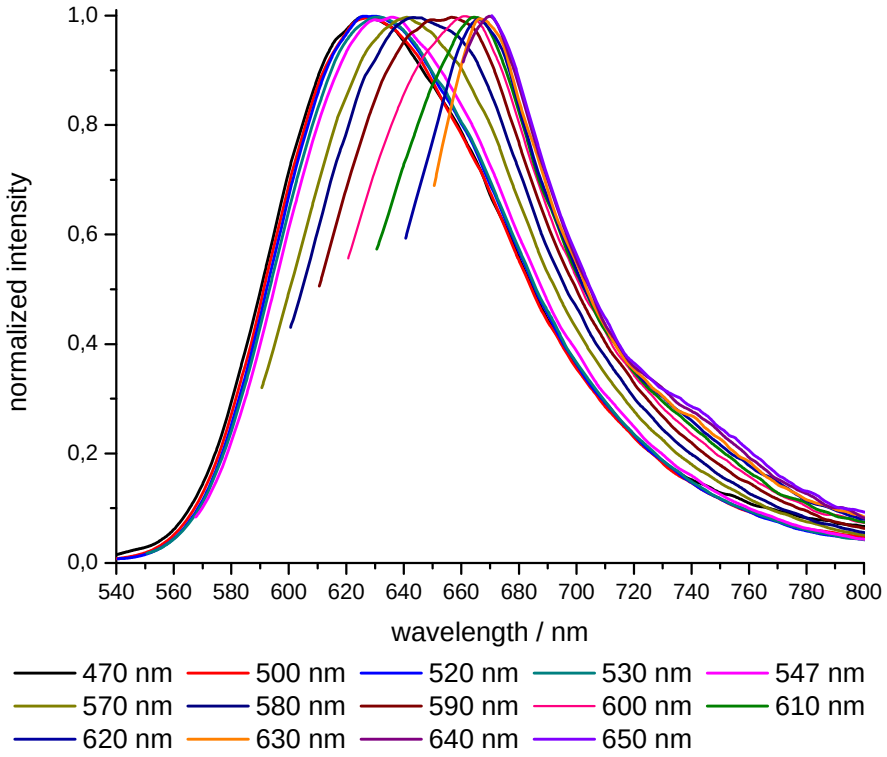

Figure S 40: Fluorescence spectra of **6b** at designated excitation wavelengths showing REES.

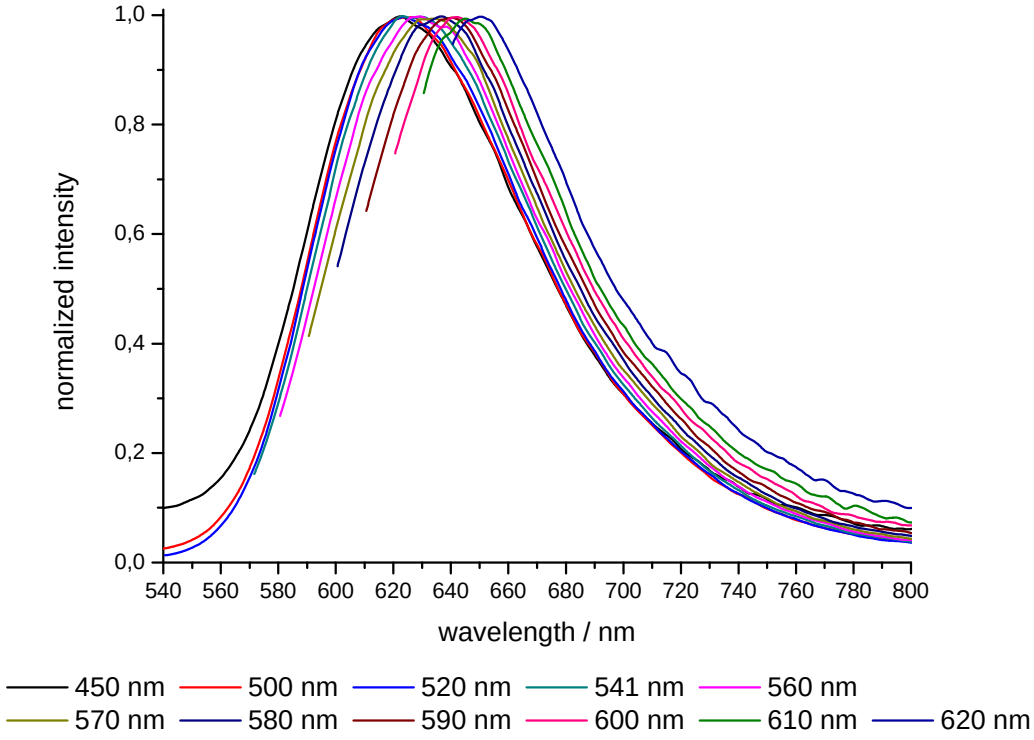

Figure S 41: Fluorescence spectra of **7e** at designated excitation wavelengths showing REES.

2.6. Fluorescence quenching of hybrid materials 6b and 7e

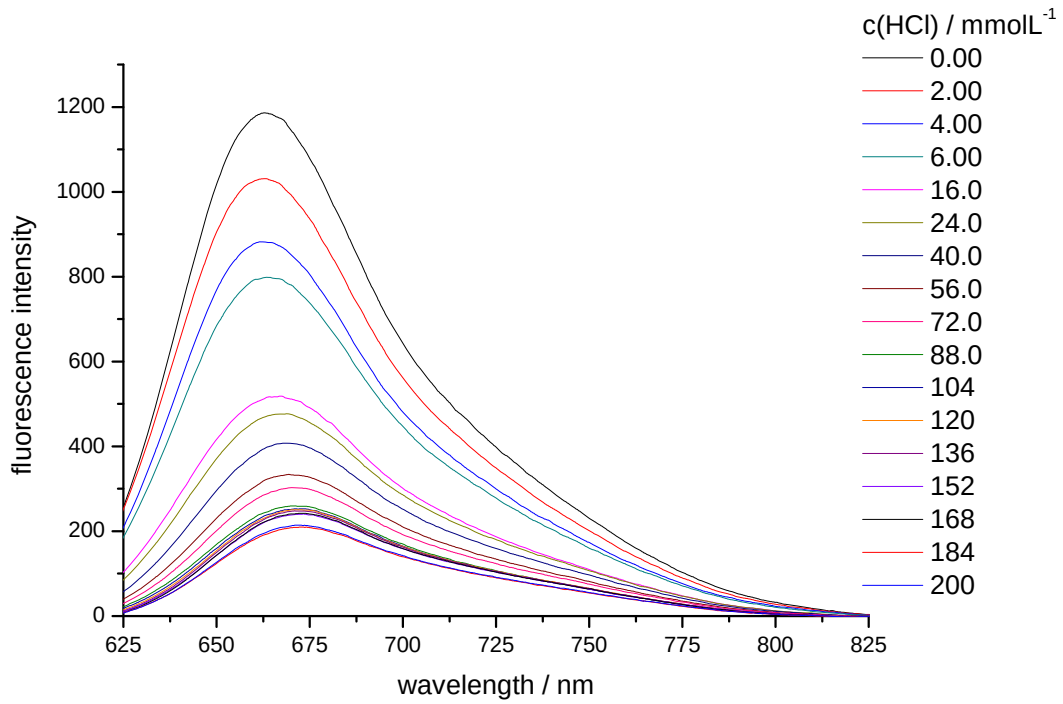

Figure S 42: fluorescence quenching of **6b** in water upon addition of designated amounts of HCl.

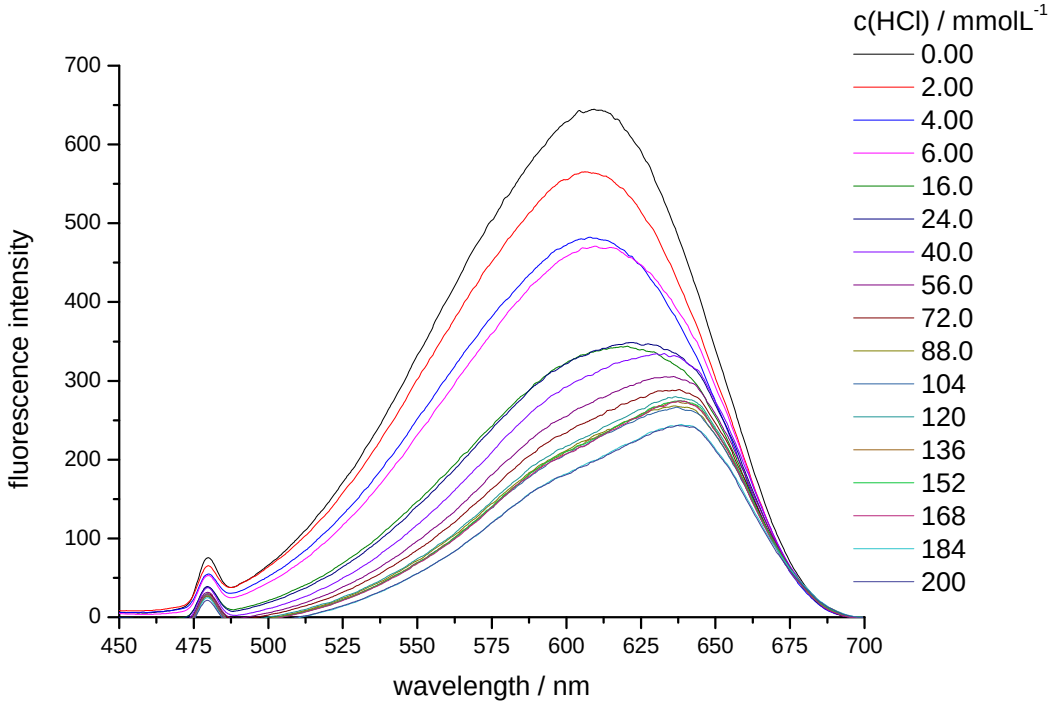

Figure S 43: excitation spectra of fluorescence quenching of **6b** in water upon addition of designated amounts of HCl ($\lambda_{emission}$ = 720 nm).

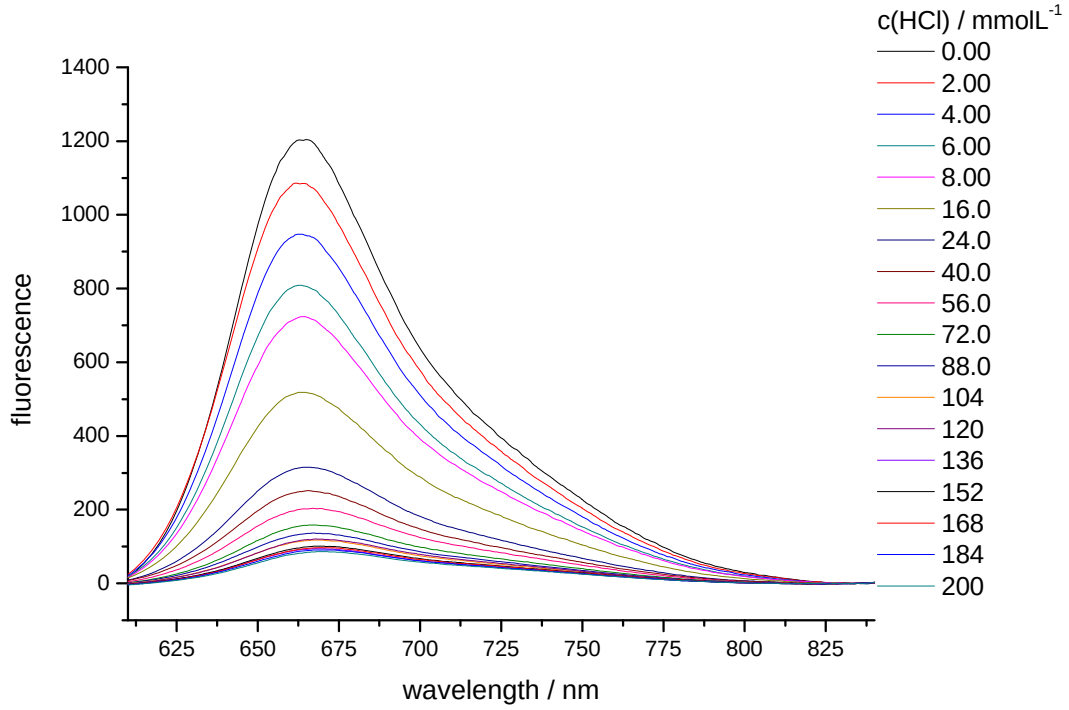

Figure S 44: fluorescence quenching of **7e** in water upon addition of designated amounts of HCl.

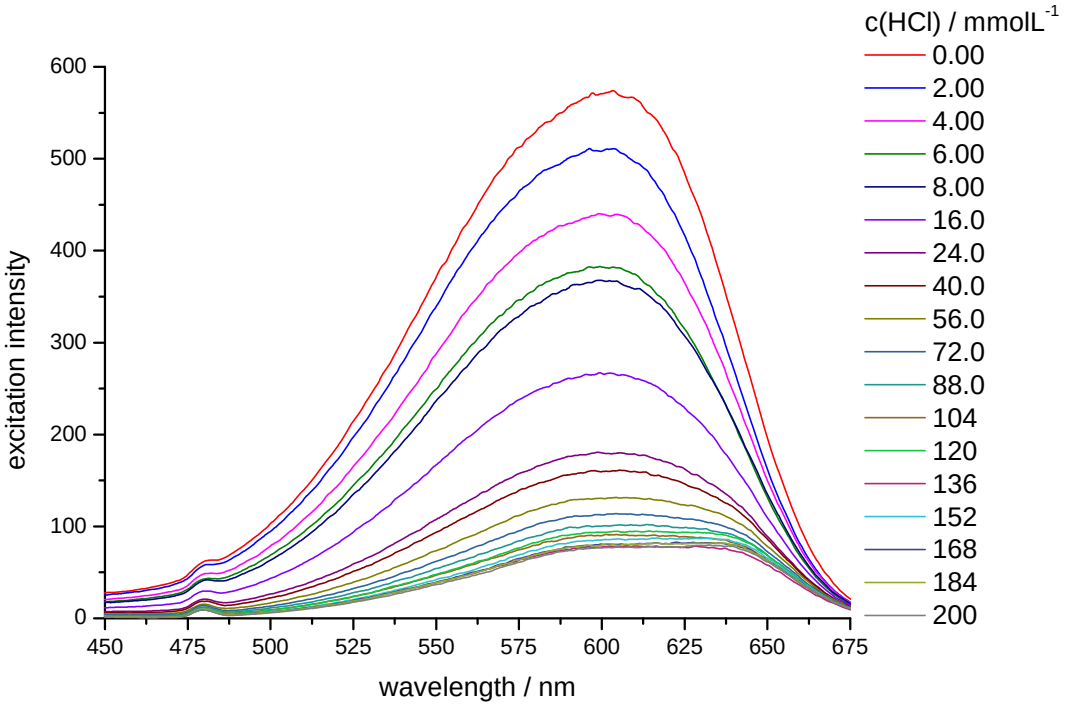

Figure S 45: excitation spectra of fluorescence quenching of **7e** in water upon addition of designated amounts of HCl ($\lambda_{emission}$ = 720 nm).