

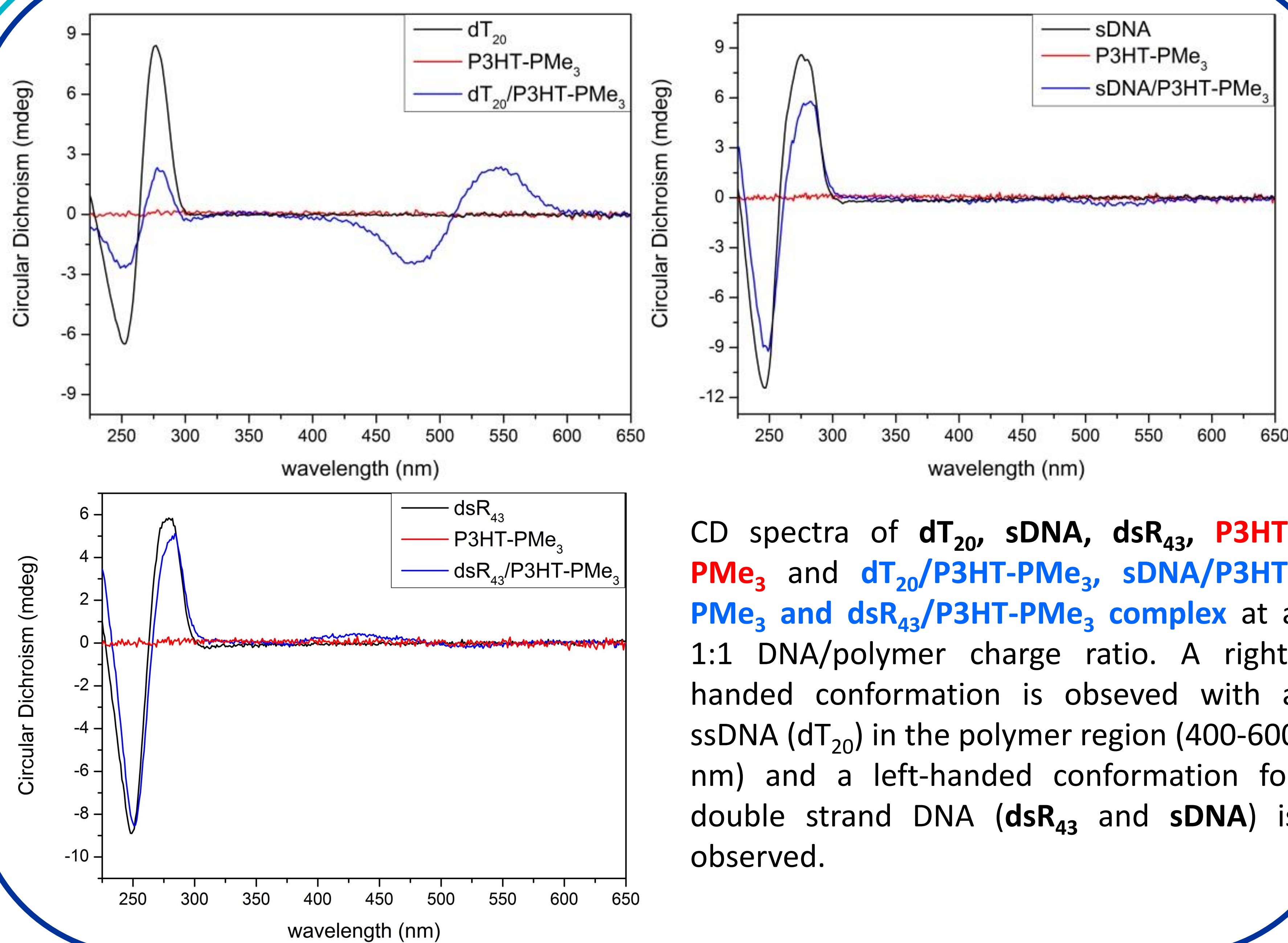
Introduction and objective :

In the family of π -conjugated polyelectrolytes, polythiophenes constitute an interesting class of polymers for biosensing application, as they combine solubility in aqueous media and have sensitive optical properties for the detection of biomolecules like DNA.^[1, 2]

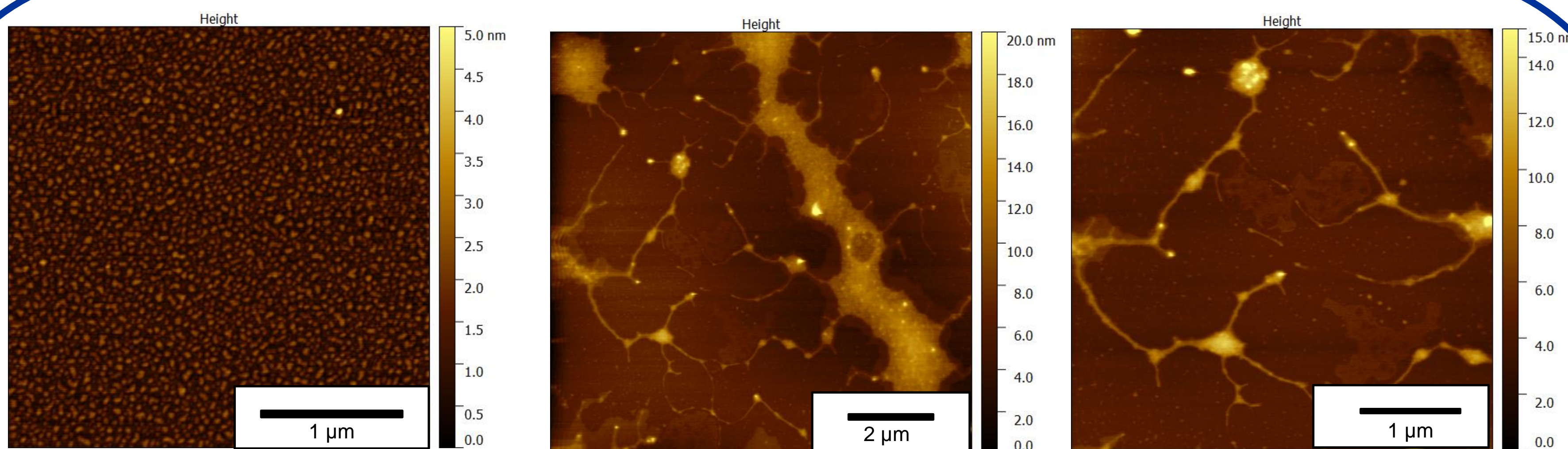
Here, we study the self-assembly of DNA (salmon DNA, **sDNA**) with a cationic poly[3-(6'-trimethylphosphonium)hexyl]thiophene-2,5-diyl] (**P3HT-PMe₃**). We study the chiroptical properties of the complex by Circular Dichroism (**CD**) and the morphology by Atomic Force Microscopy (**AFM**) and Confocal Optical Microscopy (**COM**).

Results:

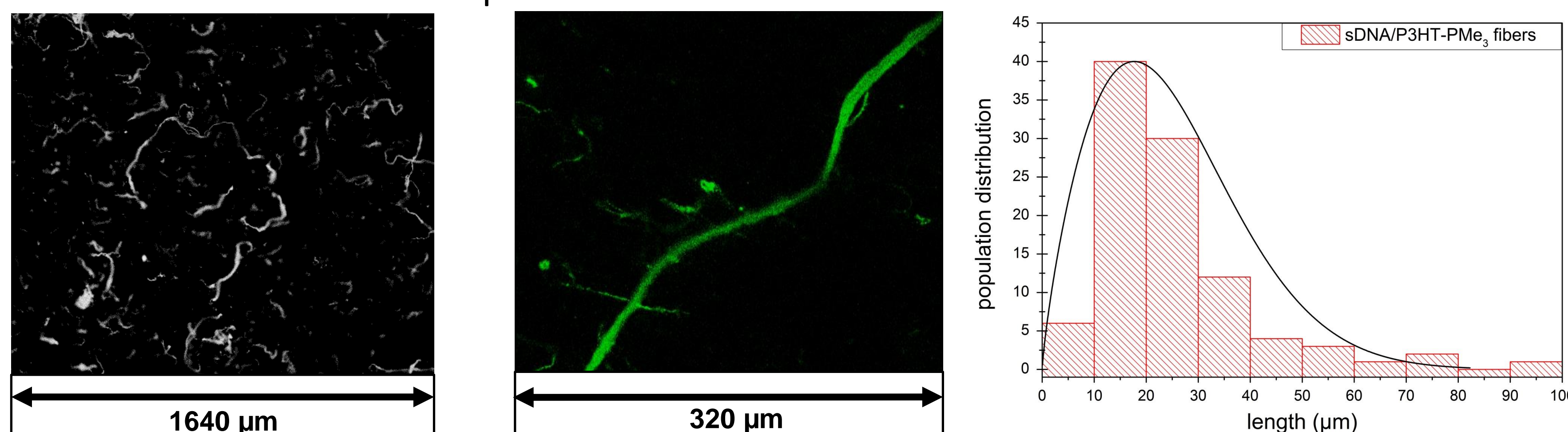
Circular Dichroism (CD)



AFM and COM



AFM images of pure **P3HT-PMe₃** and **sDNA/P3HT-PMe₃** complex. A tree-like structure with dendrites of different sizes are present.

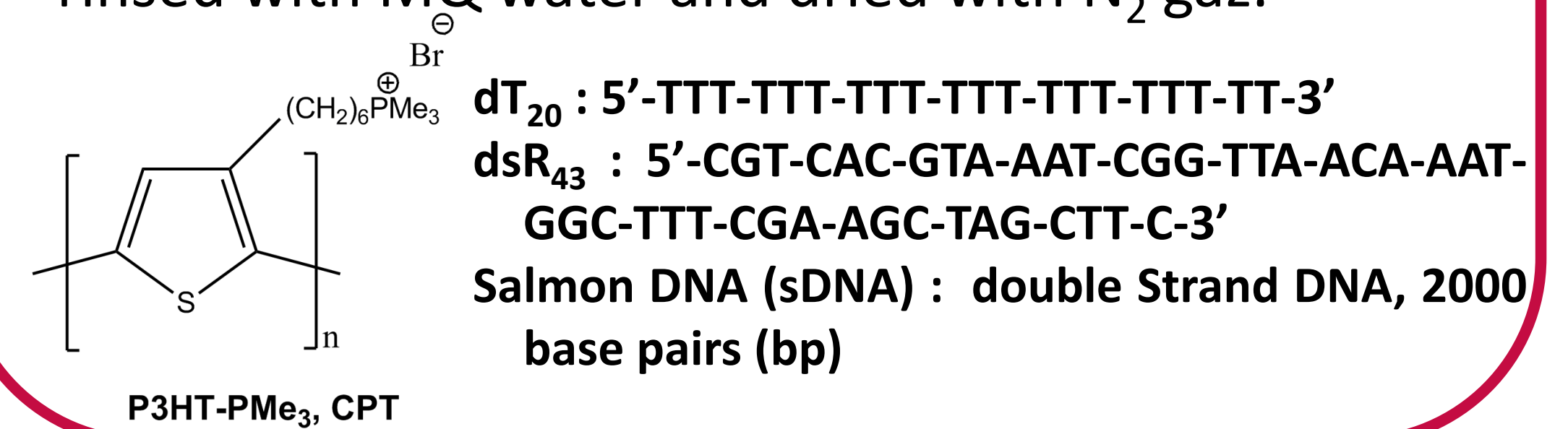


Fluorescence images of a large group of **sDNA/P3HT-PMe₃** fibers and an isolated fiber. Note that pure DNA is not fluorescent. The average size of the fibers (in the image of the left) is 28 μ m and more of the half-population have a size between "0" μ m and 40 μ m.

Preparation :

DNA and **P3HT-PMe₃** samples were dissolved in TE buffer. The concentration of the DNA was determined by UV-vis (ϵ_{260}) and the charge ratio between polymers and DNA were adjusted using this concentration.

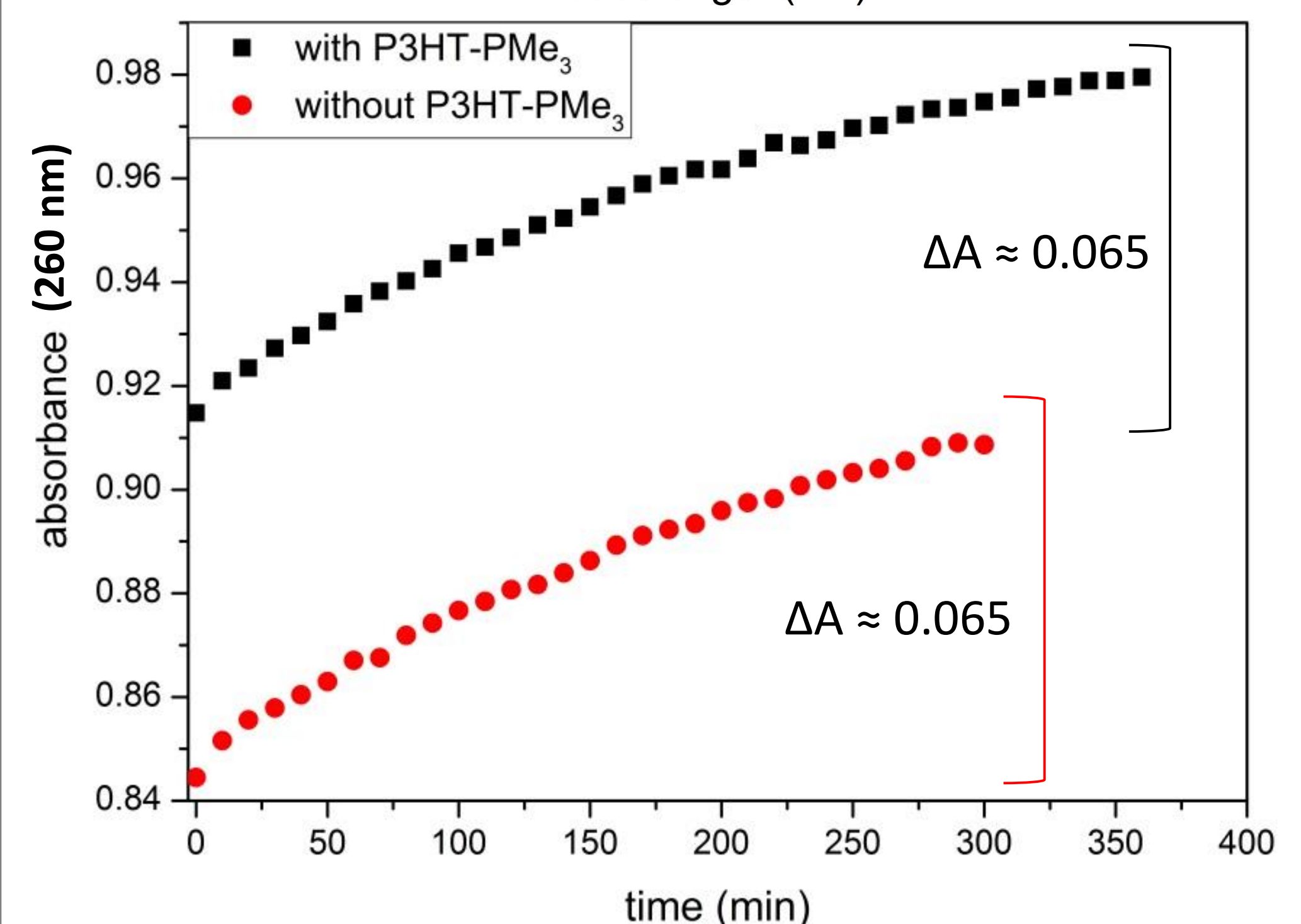
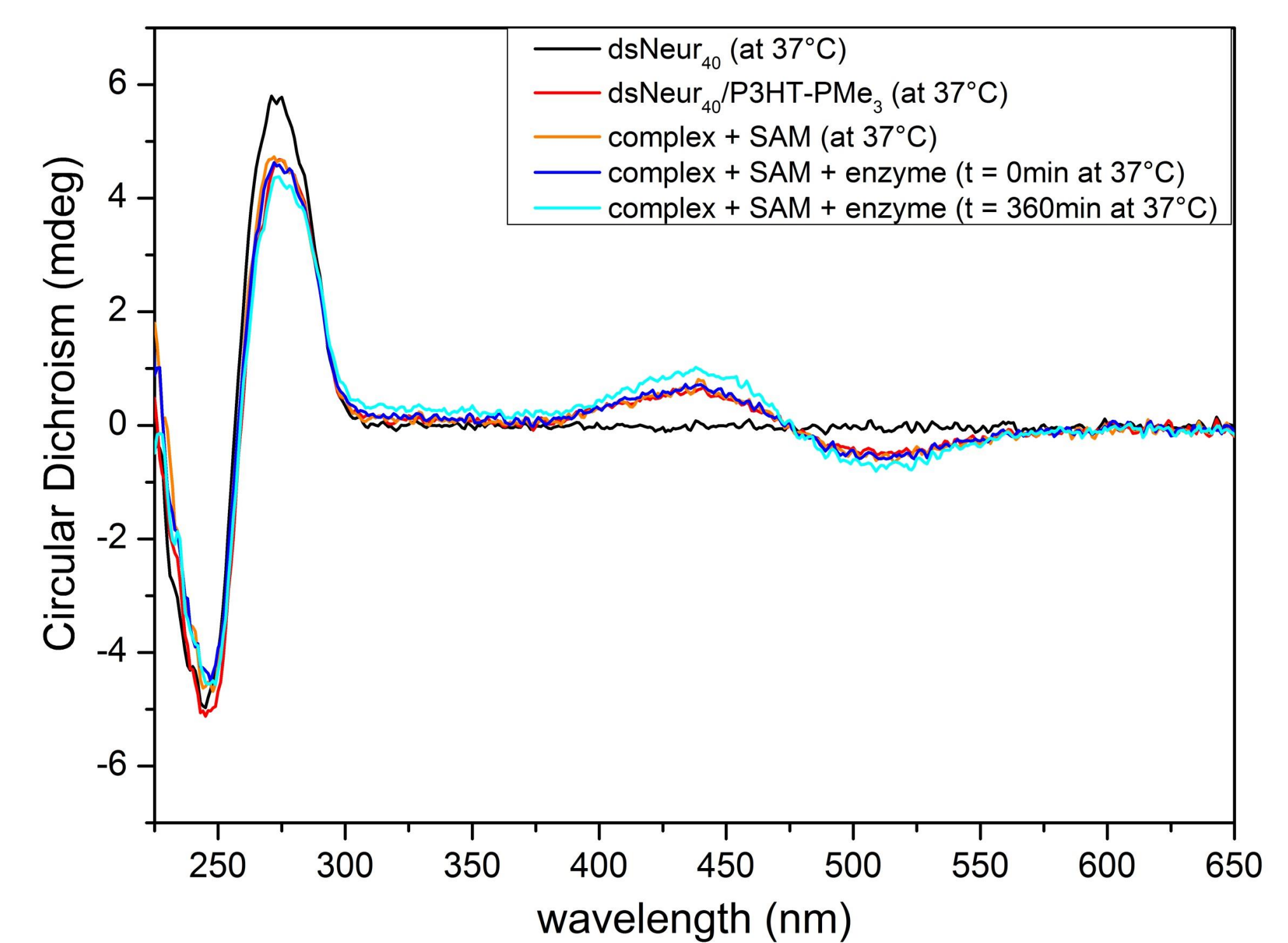
Thin deposits were prepared by sinking mica plates into a solution of DNA/polymer during 5-10 min, rinsed with MQ water and dried with N_2 gaz.



Conclusion and perspectives :

- The DNA CD signal (220-300 nm) decreased when it interacts with polymer.
- An induced CD signal appeared in the polymer region (400-600 nm) with both DNA.
- AFM images showed that the sDNA/polymer complexation leads to a fiber-like morphology.
- COM showed us the homogenous fluorescence within the self-assembled fibers.
- These results could be useful for studying structural modifications of DNA through the (chir)optical and fluorescence properties of the polymer (e.g. for detection of DNA methylation).^[3]

- dsNeur₄₀ : 5'-GAG-CTG-ATC-TGA-TCG-CCG-GCG-ACAT-CACT-CAG-GAG-ACC-GG-3'



- (+) and (-) CD signals of the polymer slightly increased during the methylation.
- The **P3HT-PMe₃**, self assembled with the **dsR₄₃**, did not seem to disturb the enzymatic activity.

References :

- [1] J. Rubio-Magnieto *et al*, *Chem. Commun.* **2013**, 49, 5483-5485.
- [2] J. Rubio-Magnieto *et al*, *Soft Matter* **2015**, 11, 6460-6471
- [3] Lv. Fengting *et al*, *small*, **2016**, 12, 696-705

