



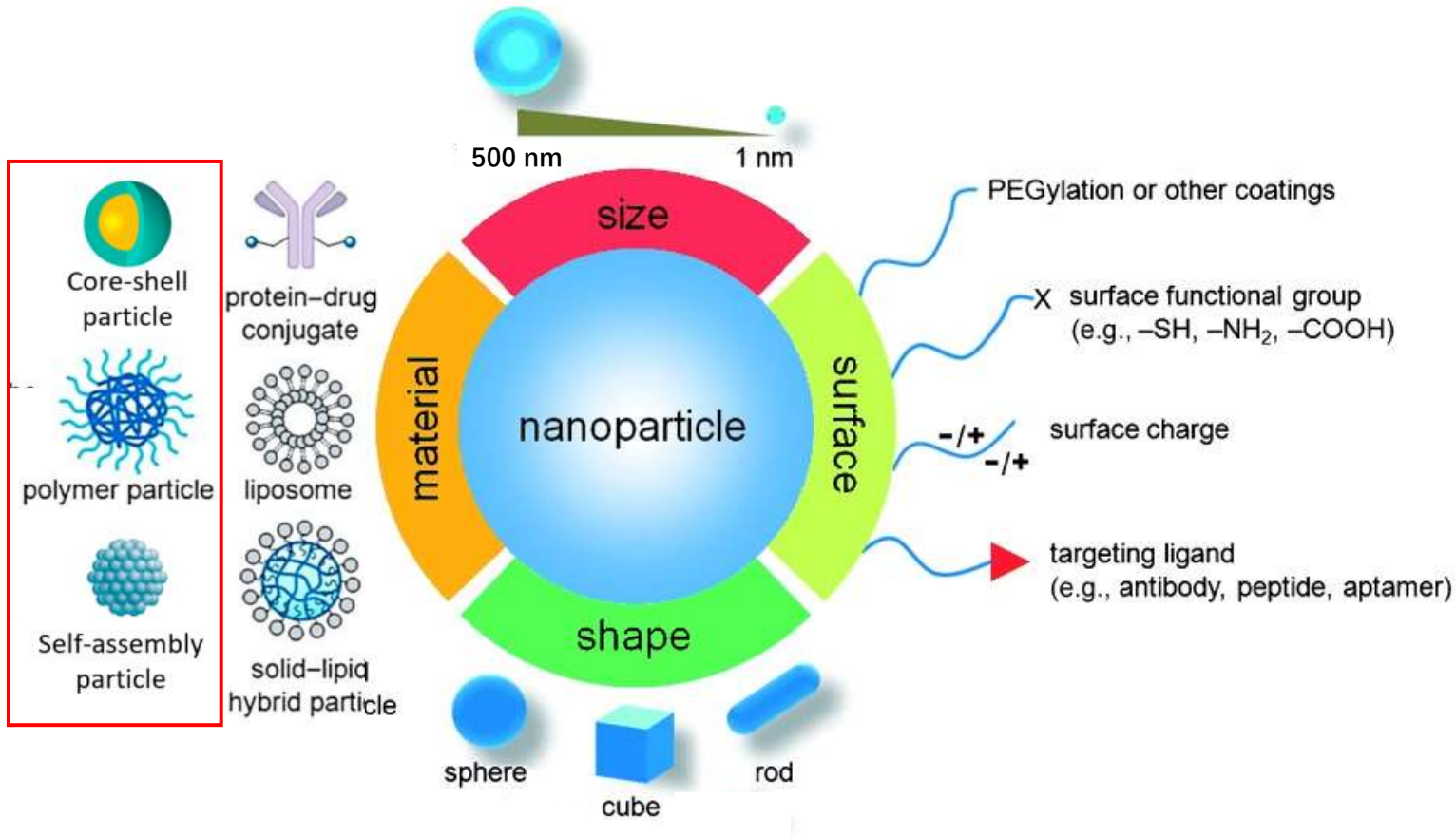
Dual-Responsive Nanoparticles Constructed Using Photo and Redox-Responsive Linkages

Yufu Wang

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Supervisors: A/Prof. Georgina Such
Dr. Chris Ritchie

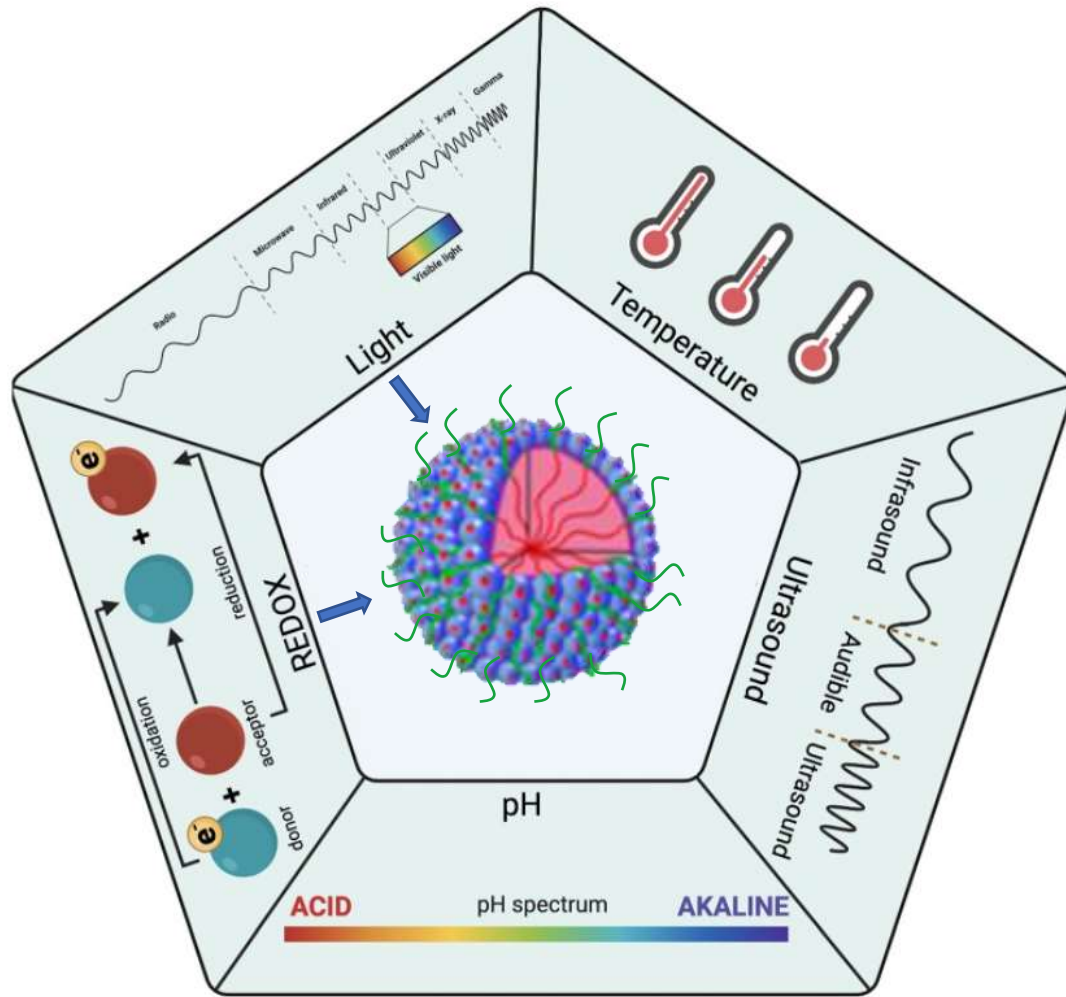




Advantages:

- Reducing immunogenicity
- Prolonging circulation times
- Precise targeting

responsive polymer



Dual Stimuli-Responsive Nanoparticles:

- Increase versatility and suitability
- Potential for combination therapies

Redox:

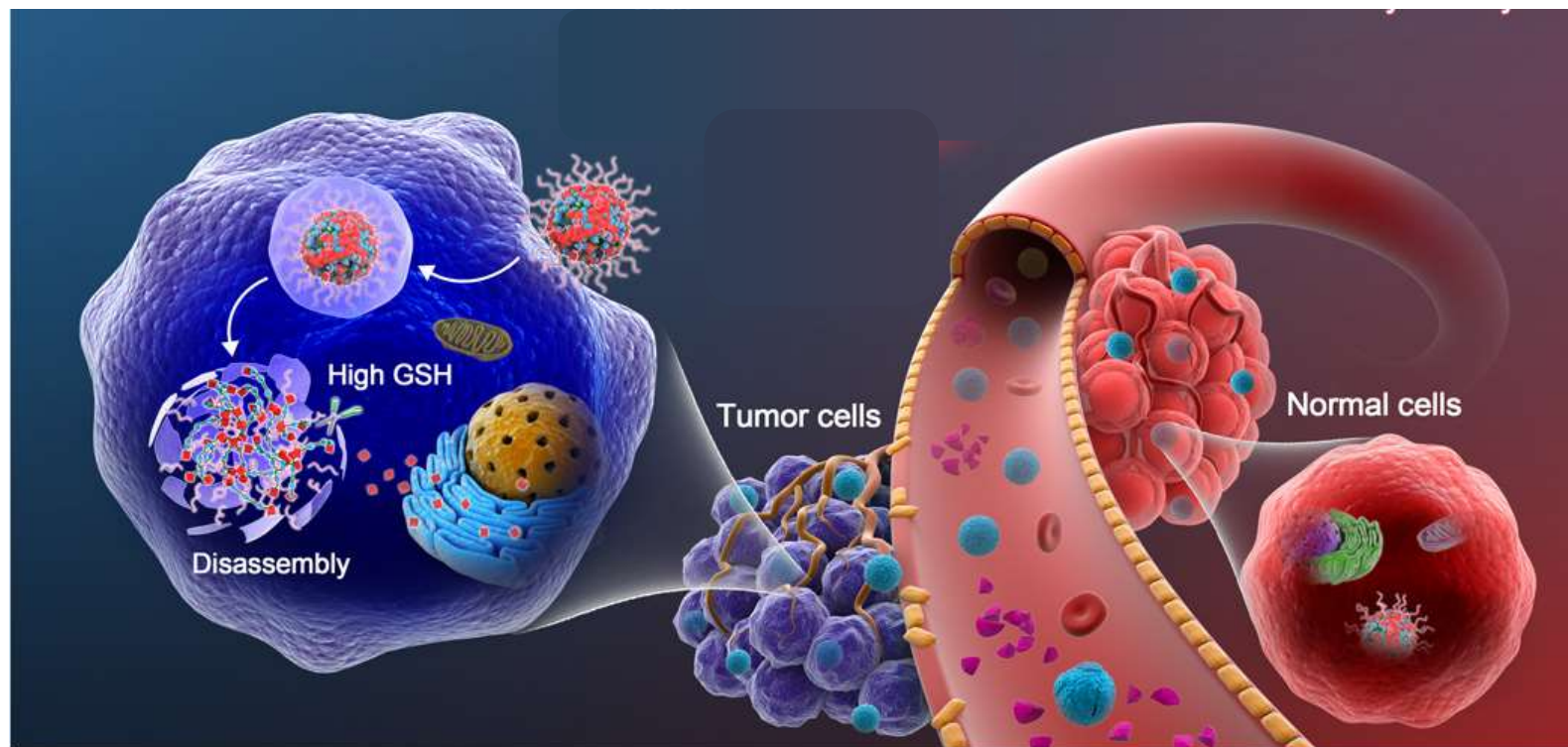
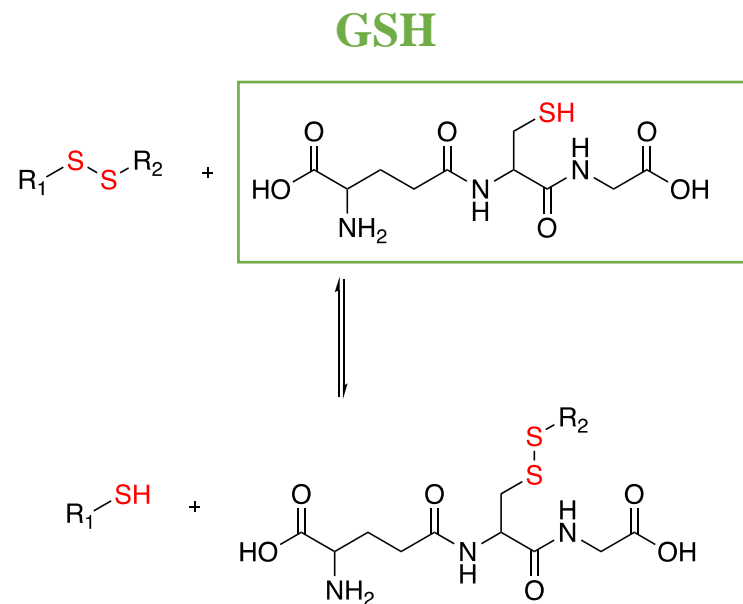
Internal Stimuli

Cancer Tissue

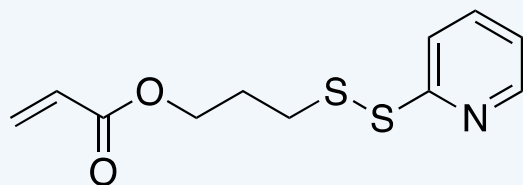
Light:

External Stimuli

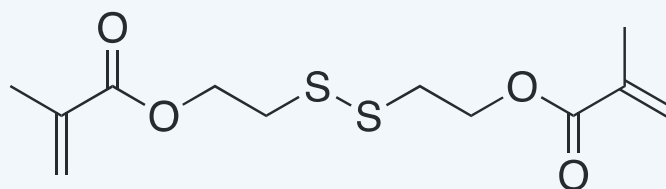
Spatiotemporal
Release



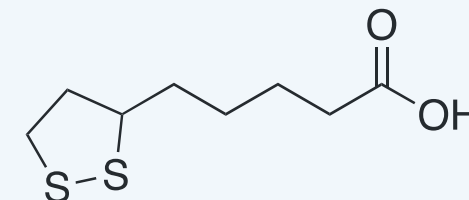
Potential building blocks:



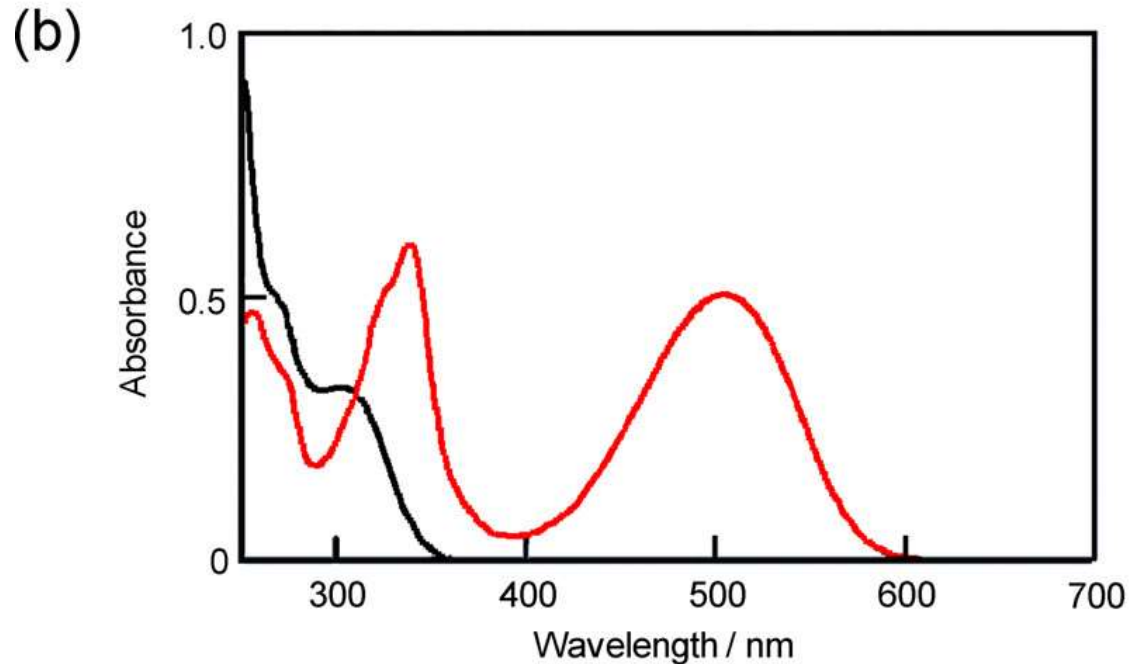
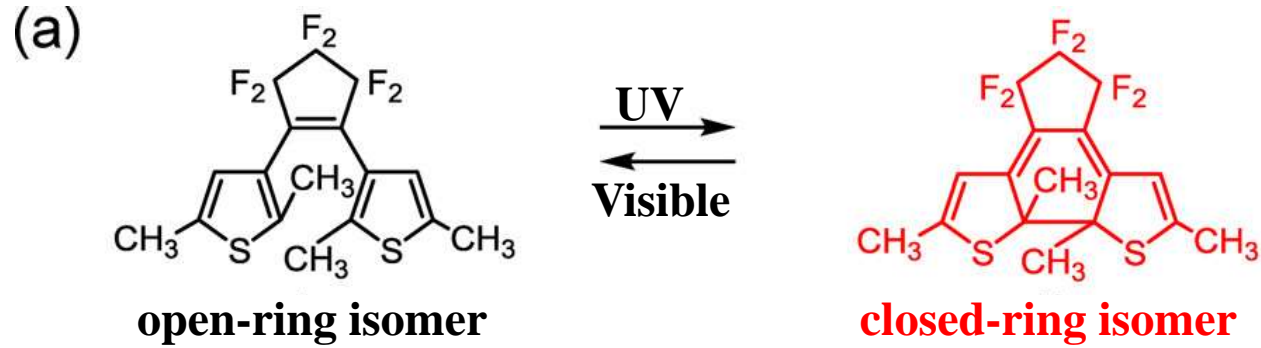
Pyridyl disulfide monomer



Disulfide crosslinker



Lipoic acid

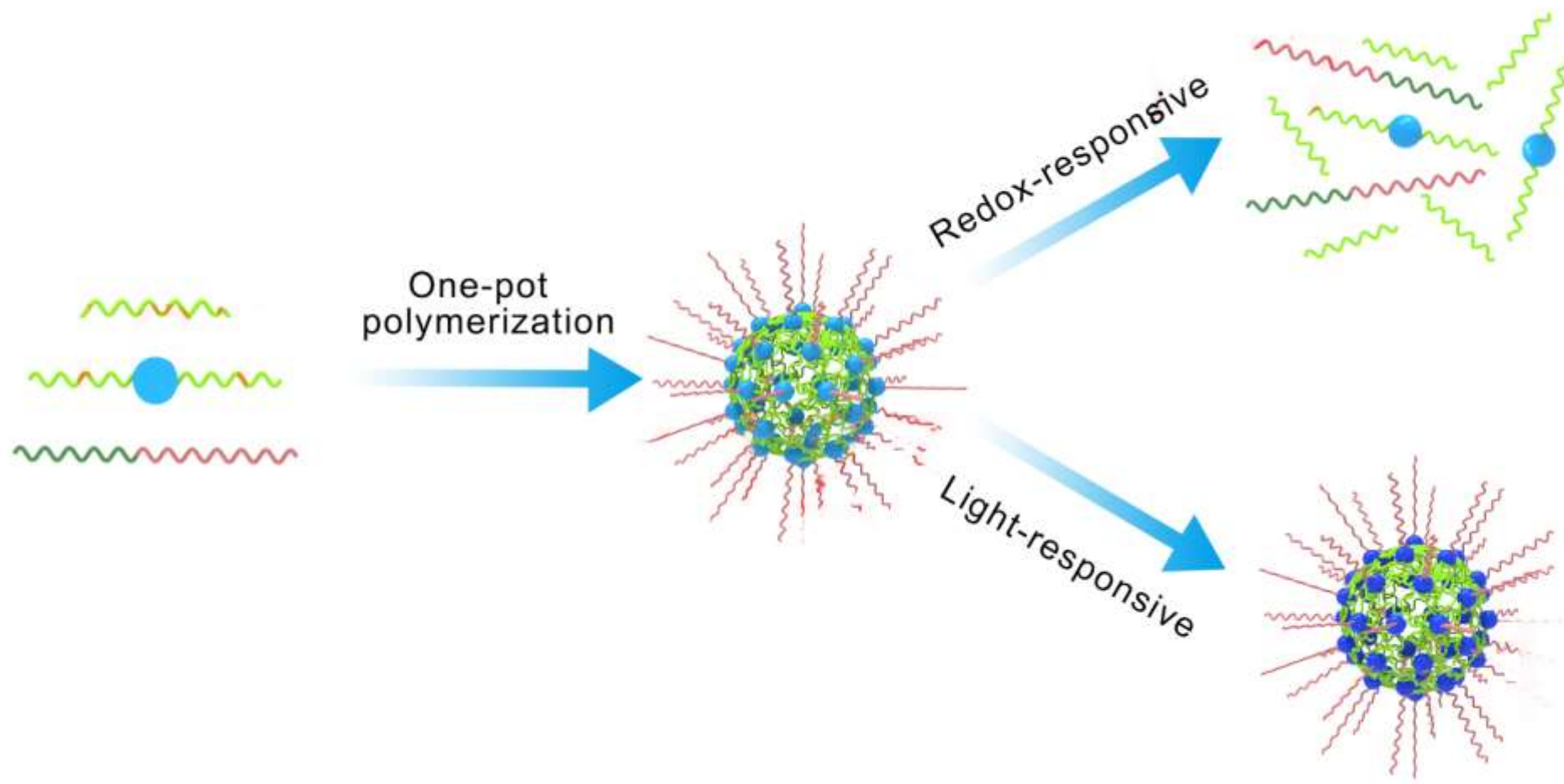


Photochromic materials:

reversible transformation

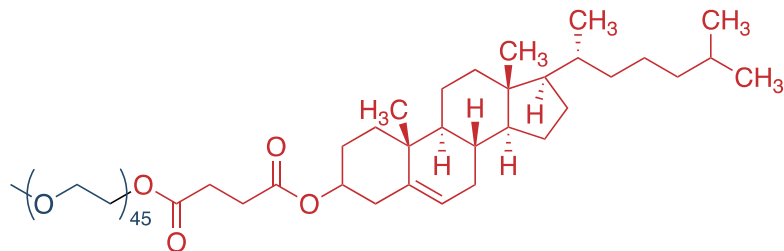
two isomers having different spectra

induced by photoirradiation

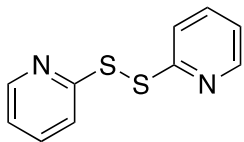




DODT (dithiol monomer)

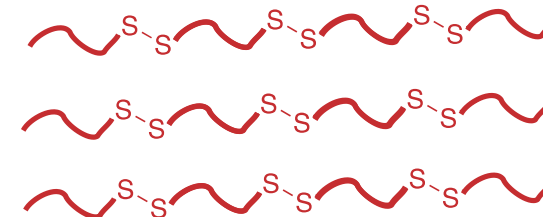
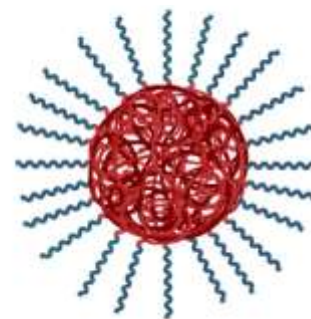


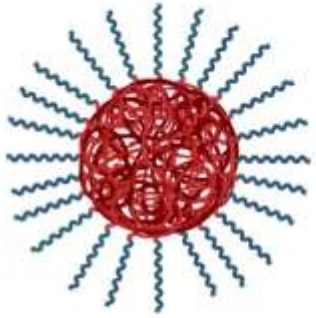
PEG-cholesterol (stabilizer)



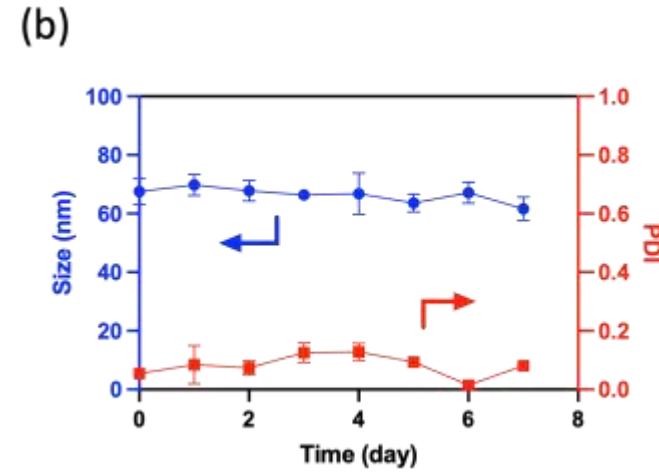
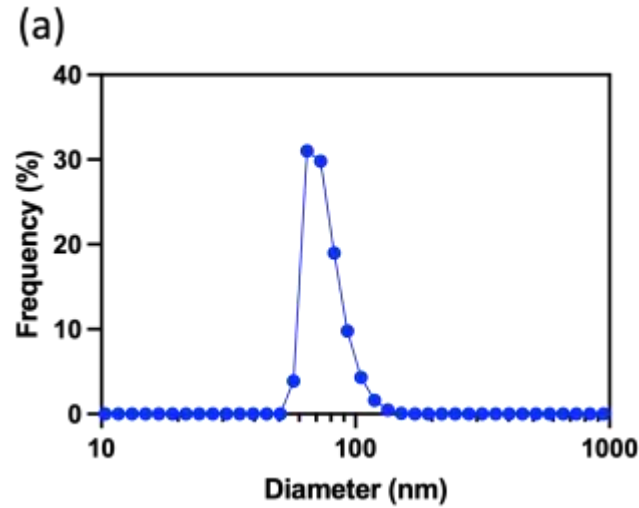
DPS (oxidising agent)

One-pot
polymerization

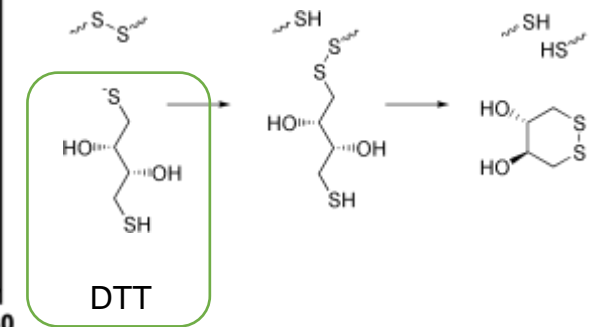
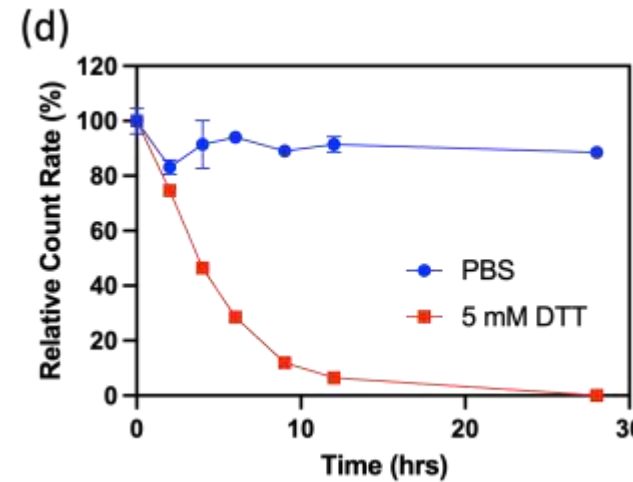
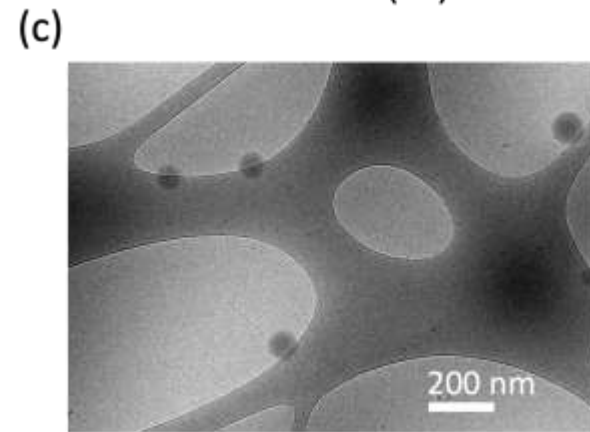


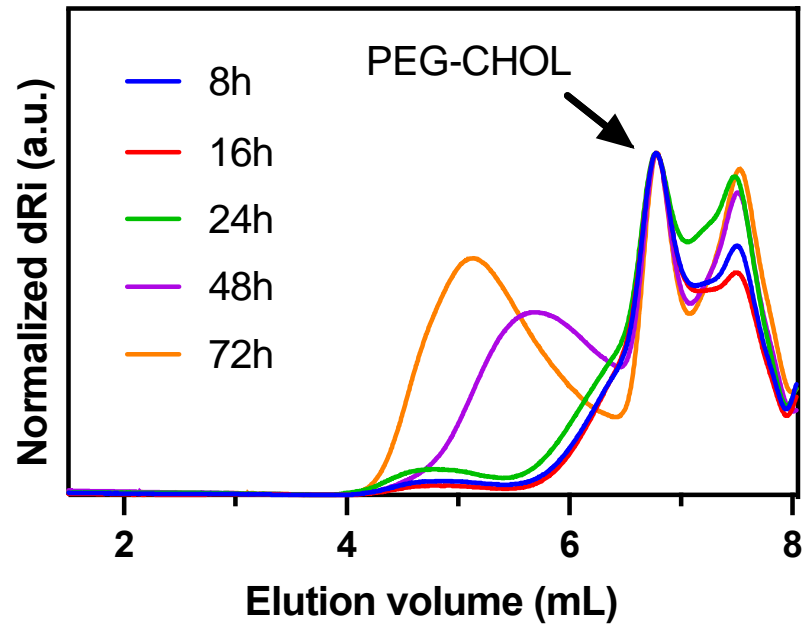


- average particle size: 60-70 nm



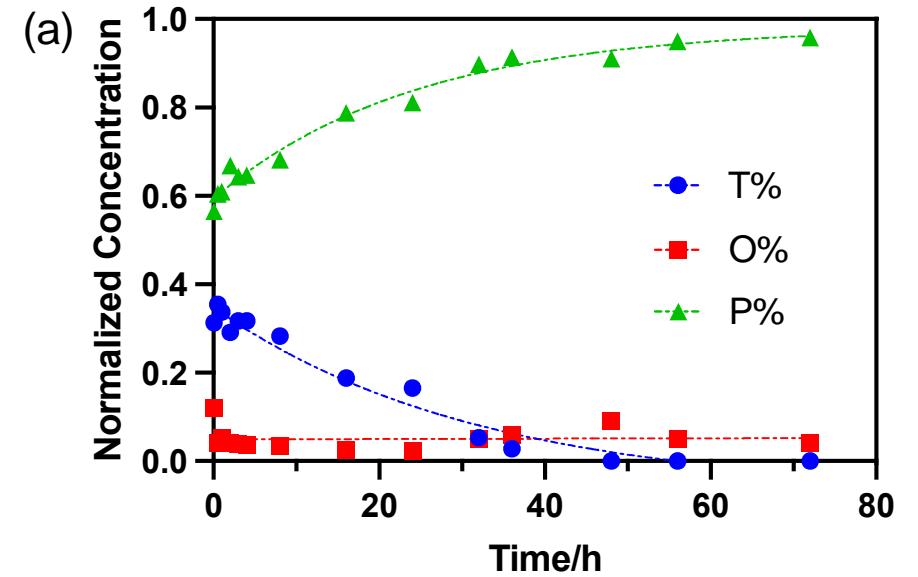
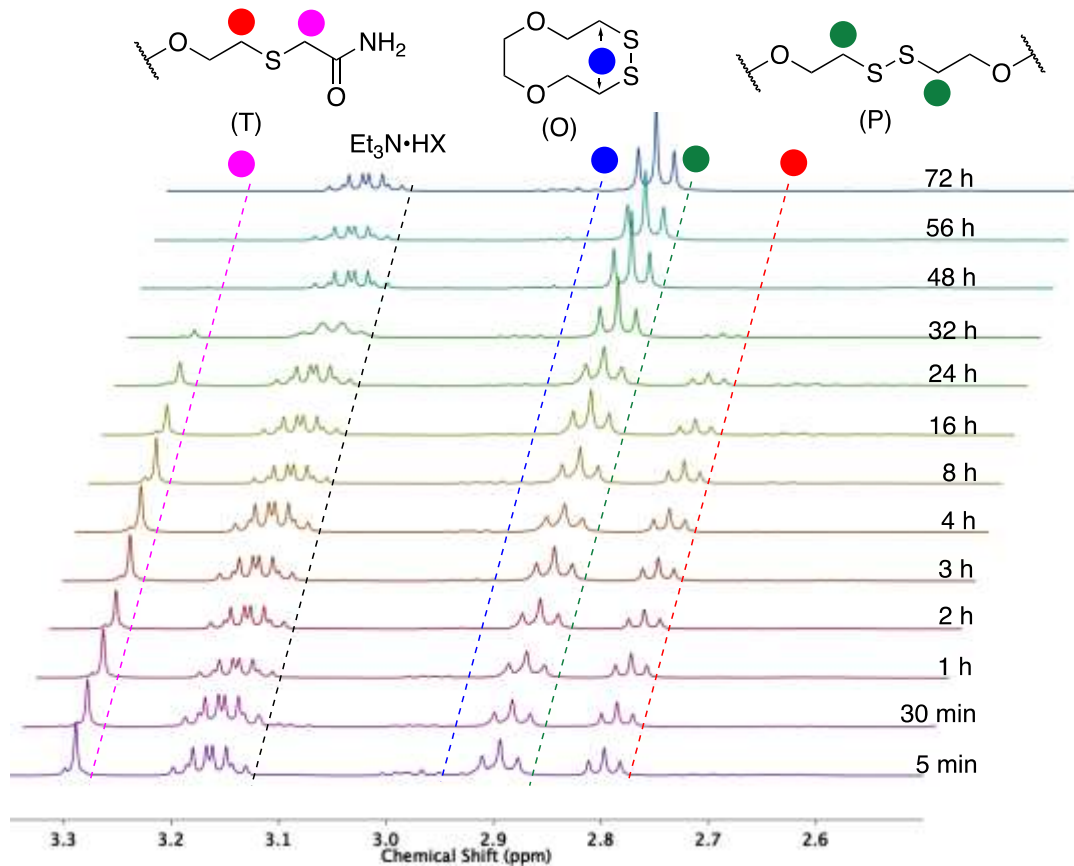
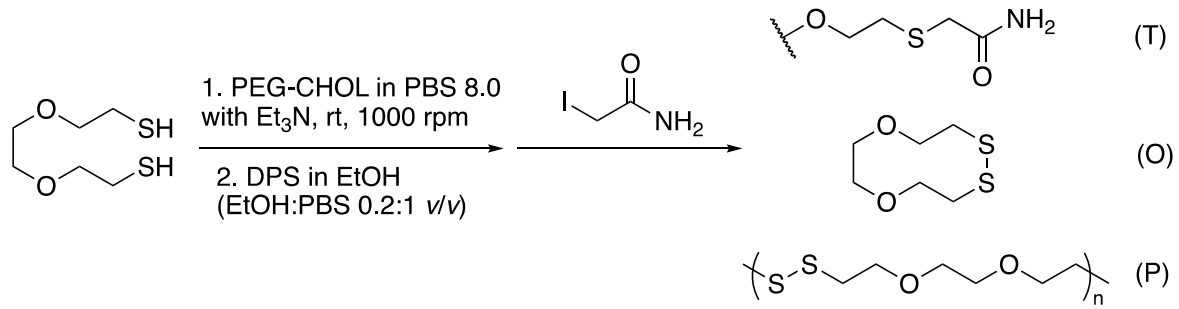
✓ good stability over one week



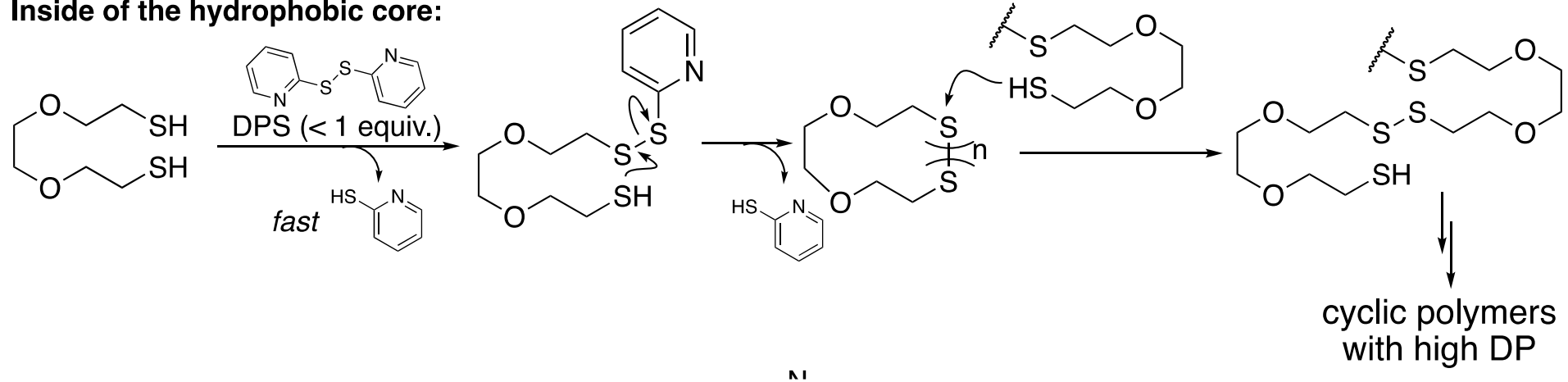


The polymer peak becomes more and more obvious over time

DTT

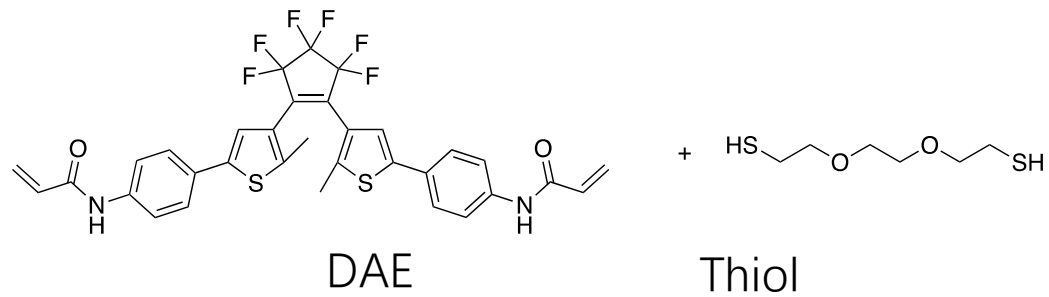


(a) Inside of the hydrophobic core:

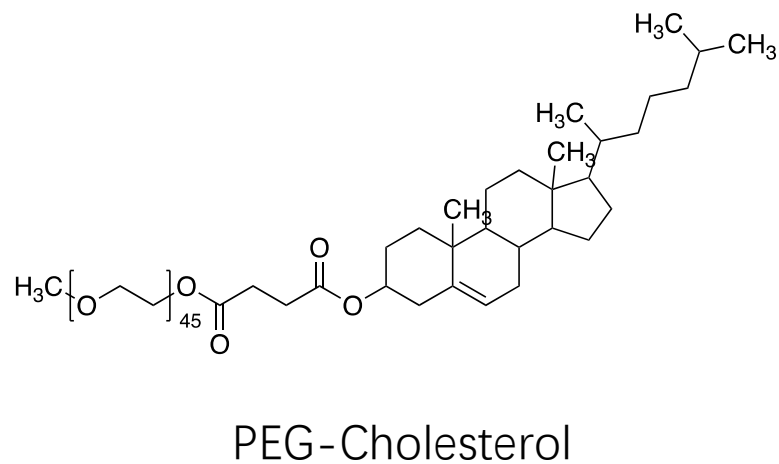


Synthesis of DAE-loaded nanoparticles

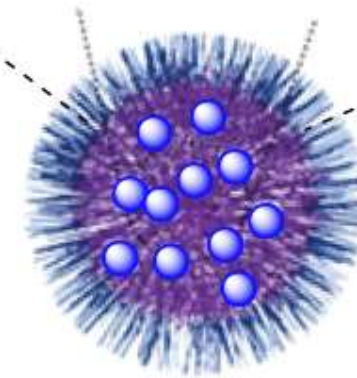
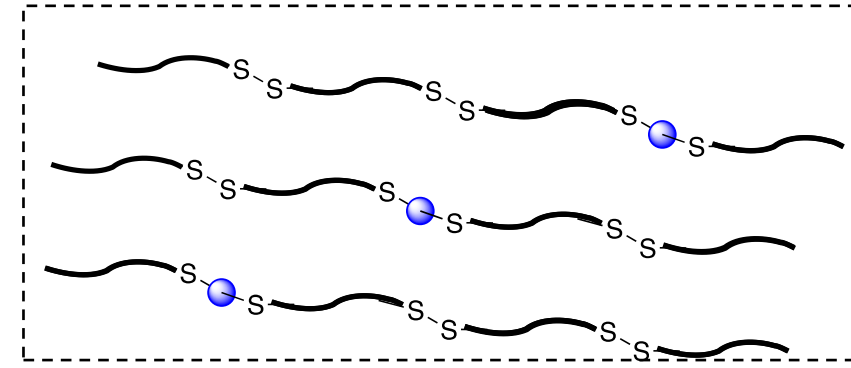
Core:



Shell:

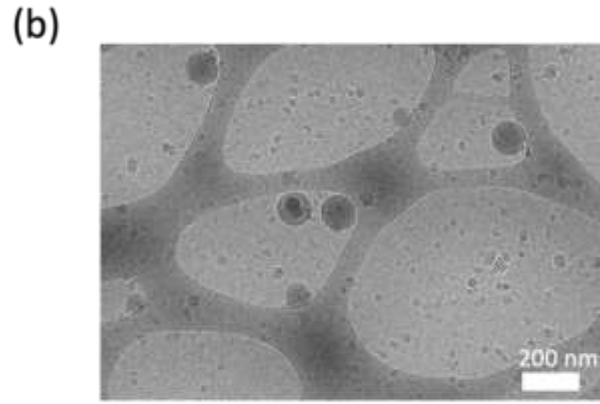
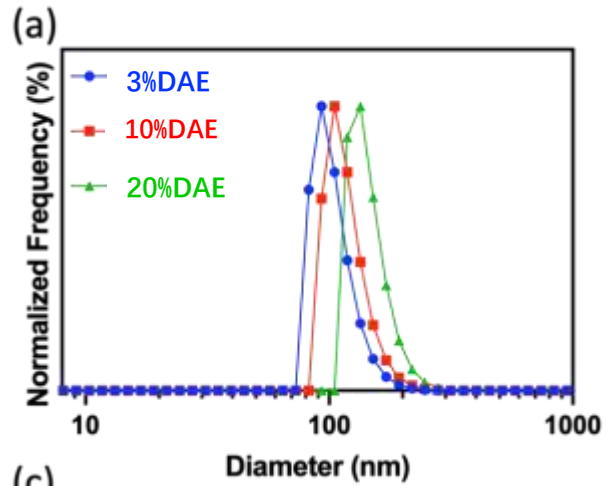


One-pot
polymerization
DPS

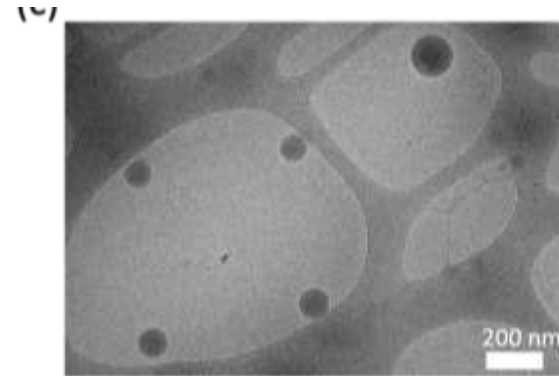


DAE: 

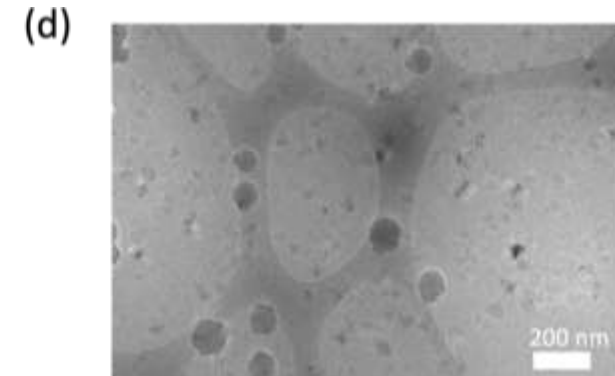
Thiol: HS  SH



3%DAE

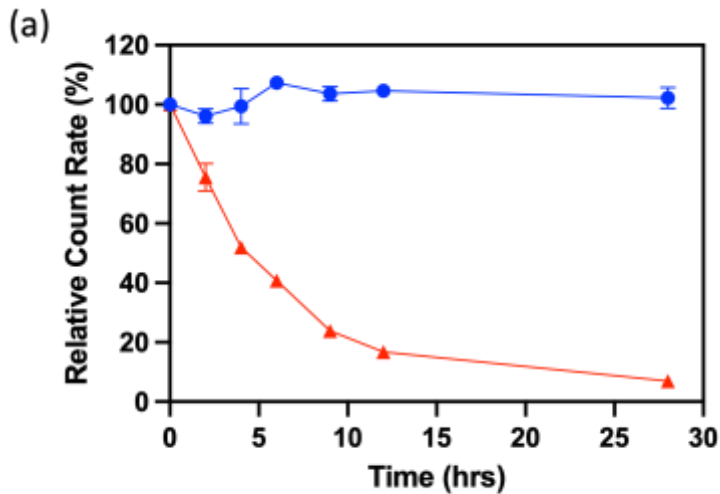


10%DAE

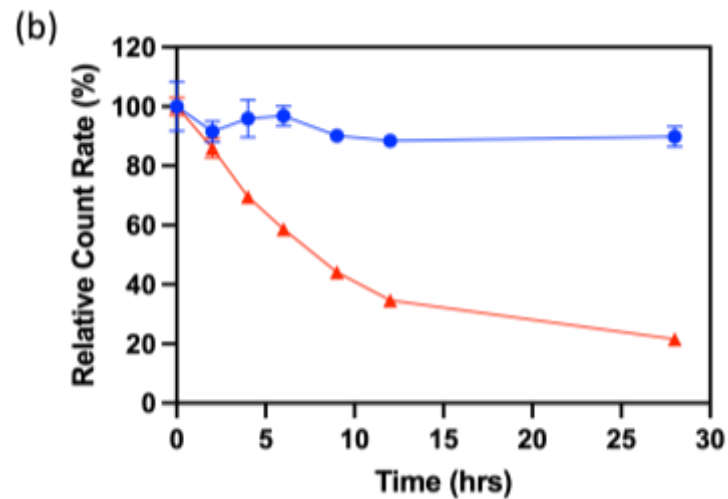


20%DAE

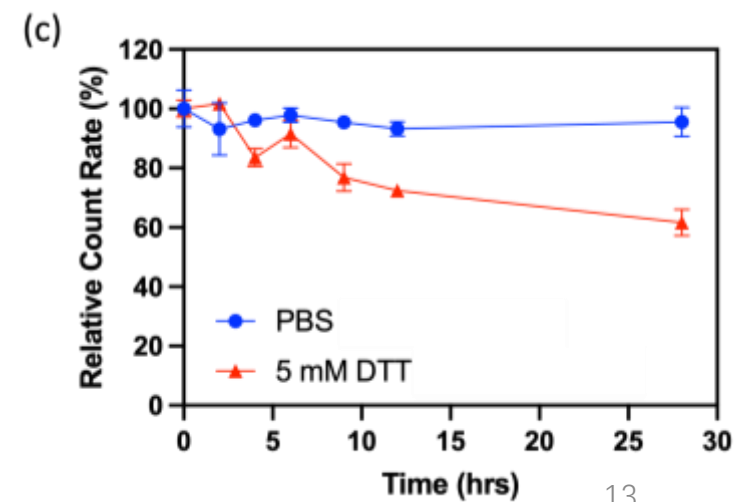
3%DAE



10%DAE

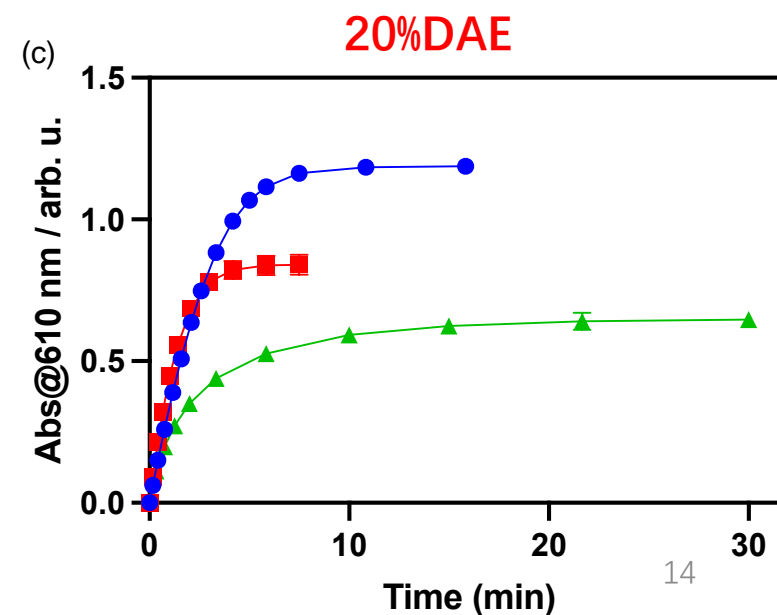
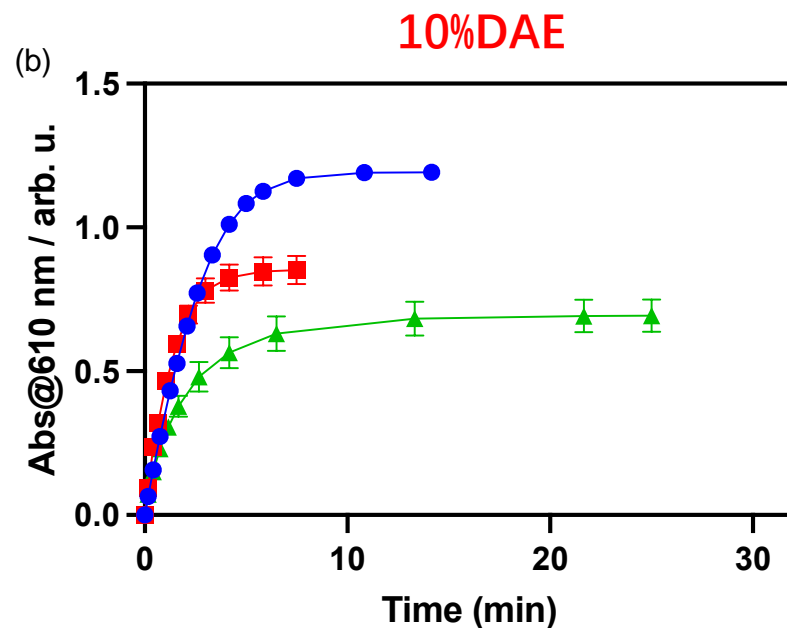
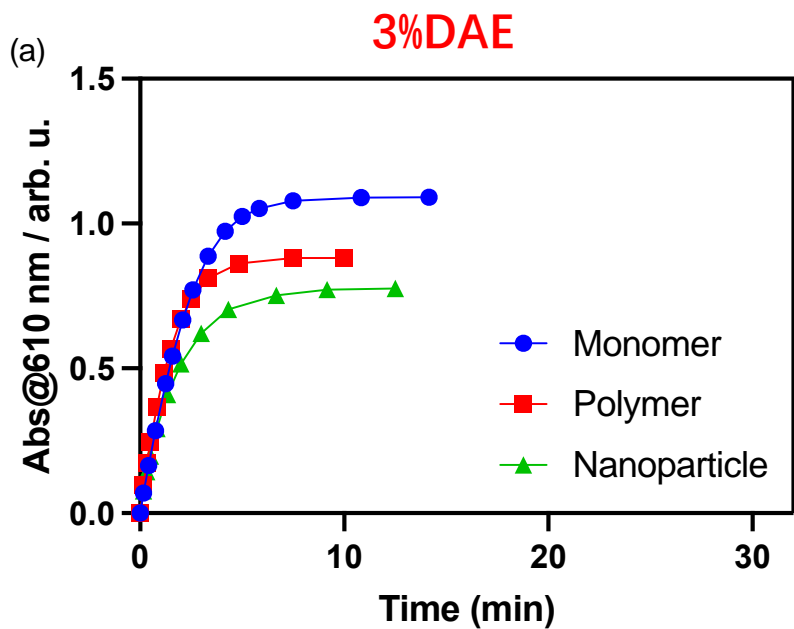
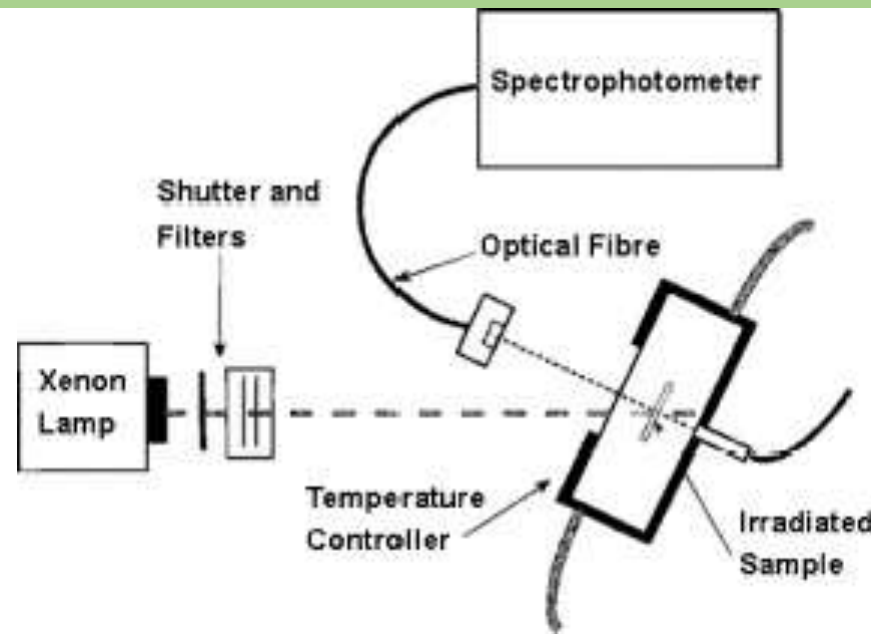


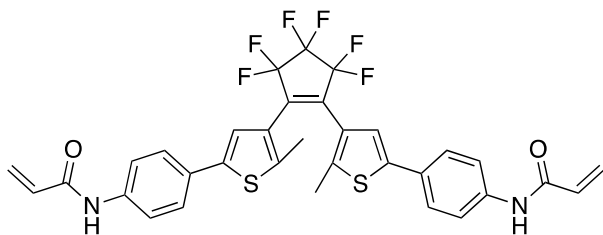
20%DAE



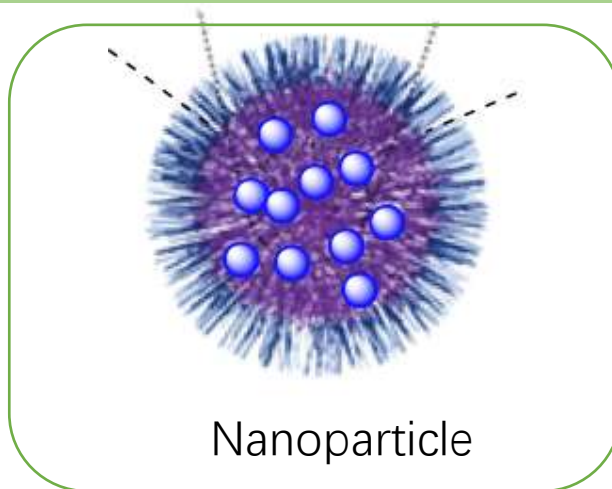
The rate of photochromic transition.

continuous irradiation

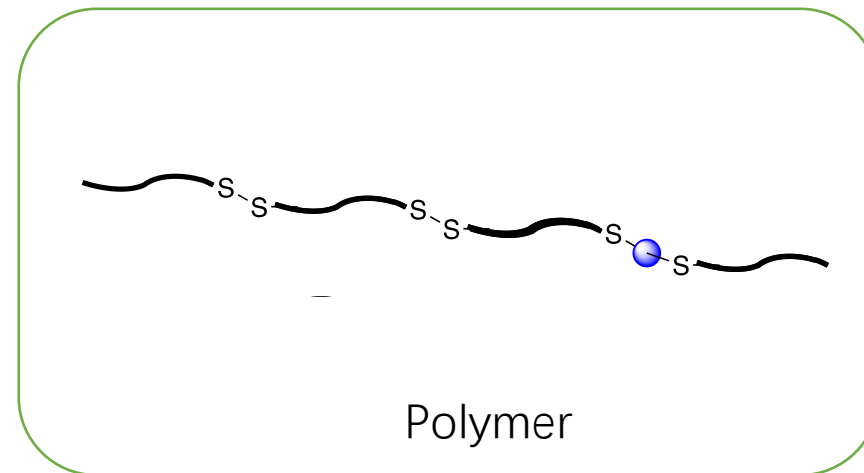




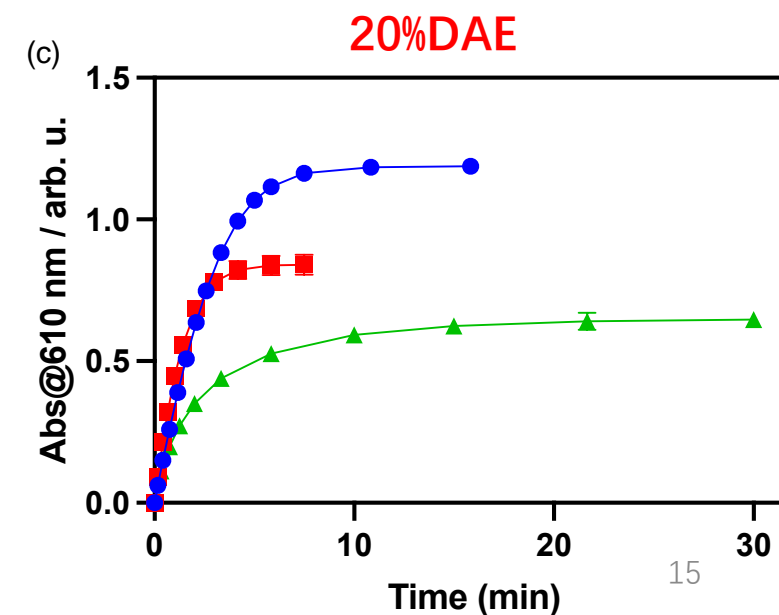
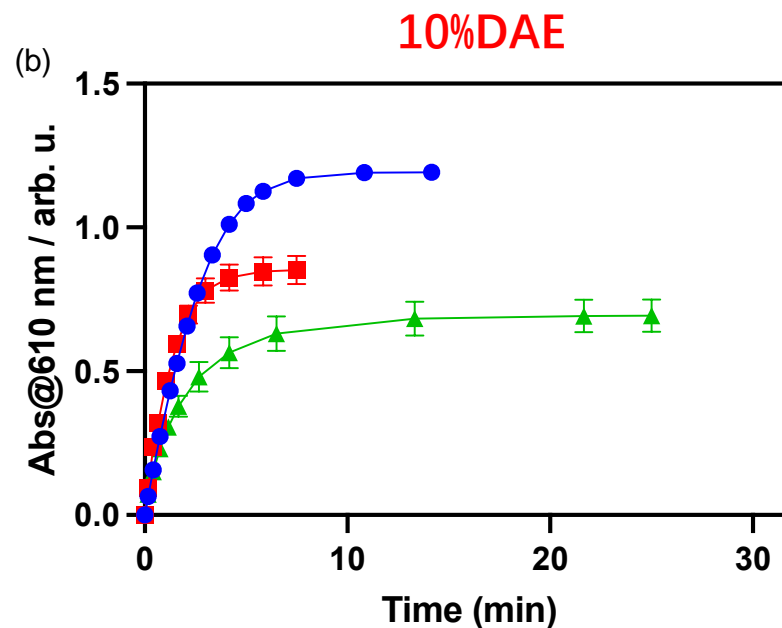
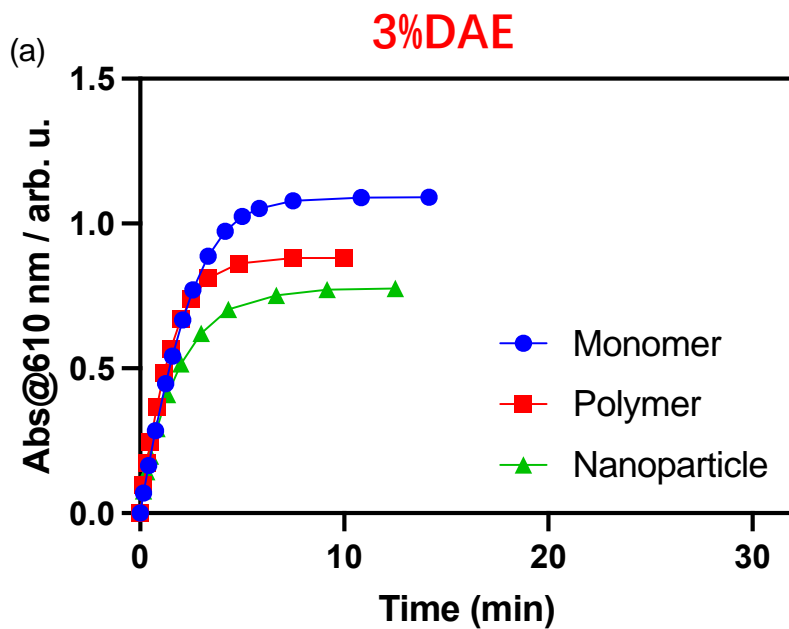
Monomer



Nanoparticle



Polymer



- ✓ The one-pot synthesis of dual photo- and redox-responsive DAE nanoparticles was successfully achieved, with varying DAE concentrations.
- ✓ The nanoparticles in this series exhibit tunable redox disassembly, ranging from 100% to 40%, based on the DAE content.
- ✓ They display different photochromic rates under UV irradiation, depending on the amount of DAE incorporated. Notably, the rates were significantly slowed in the nanoparticle form, indicating that the matrix impacts their behavior.

Acknowledgements



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institute



MONASH University



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