NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

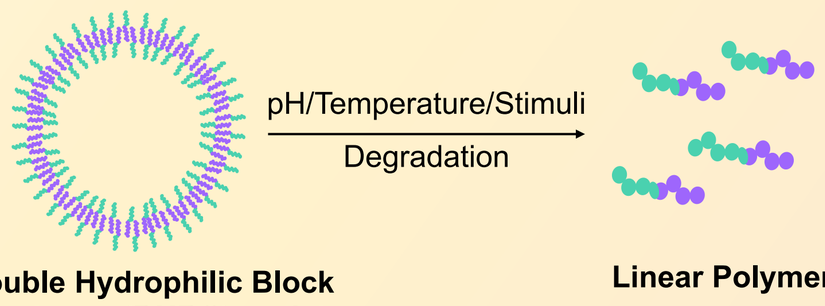
Odyssey Research Programme
School of Physical and Mathematical Sciences

One-Step Synthesis of the Smart Double Hydrophilic Block Copolymer Nano-Assemblies

Lim Yan Ping Apple

Supervised by Prof Atsushi Goto; Mentored by Dr. Jit Sarkar

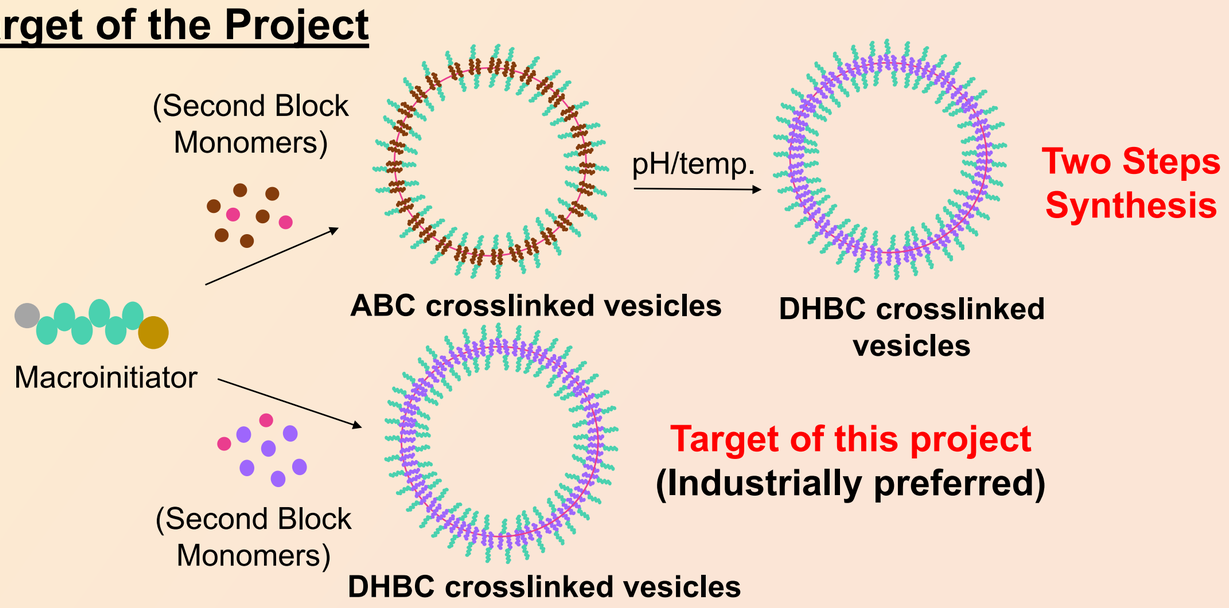
Stimuli-Responsive DHBC vesicles



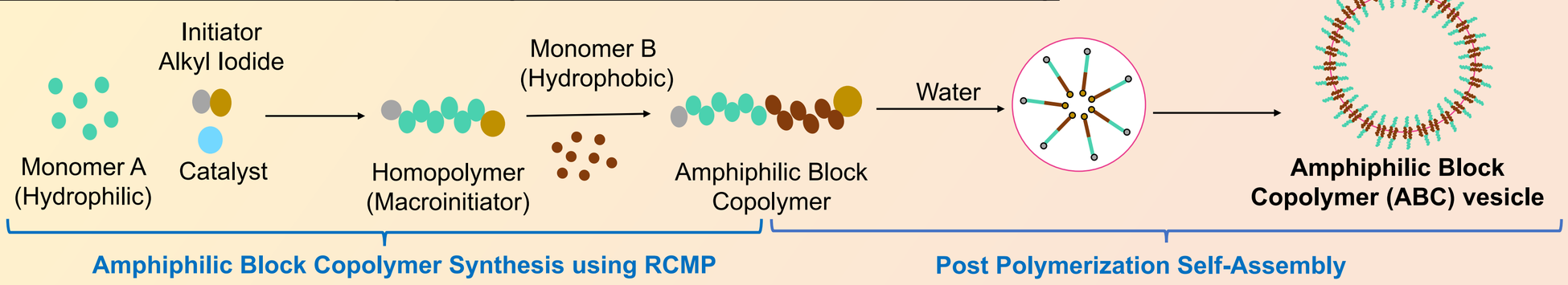
Advantage of Stimuli-Responsive Vesicle:
- A controlled release of encapsulated material by external stimuli

Advantage of DHBC:
- Easier excretion out of the body

Target of the Project



Amphiphilic Block Copolymer Synthesis and Their Self-Assembly

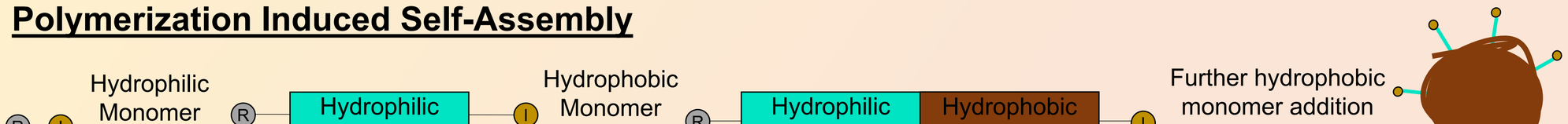


Advantage of RCMP:
- Inexpensive and less-toxic organic molecule as catalyst
- No use of toxic transition metal catalyst and sulfur compounds

Disadvantages of Post Polymerization Self-Assembly:
- Polymer concentration less than 1wt%[1]

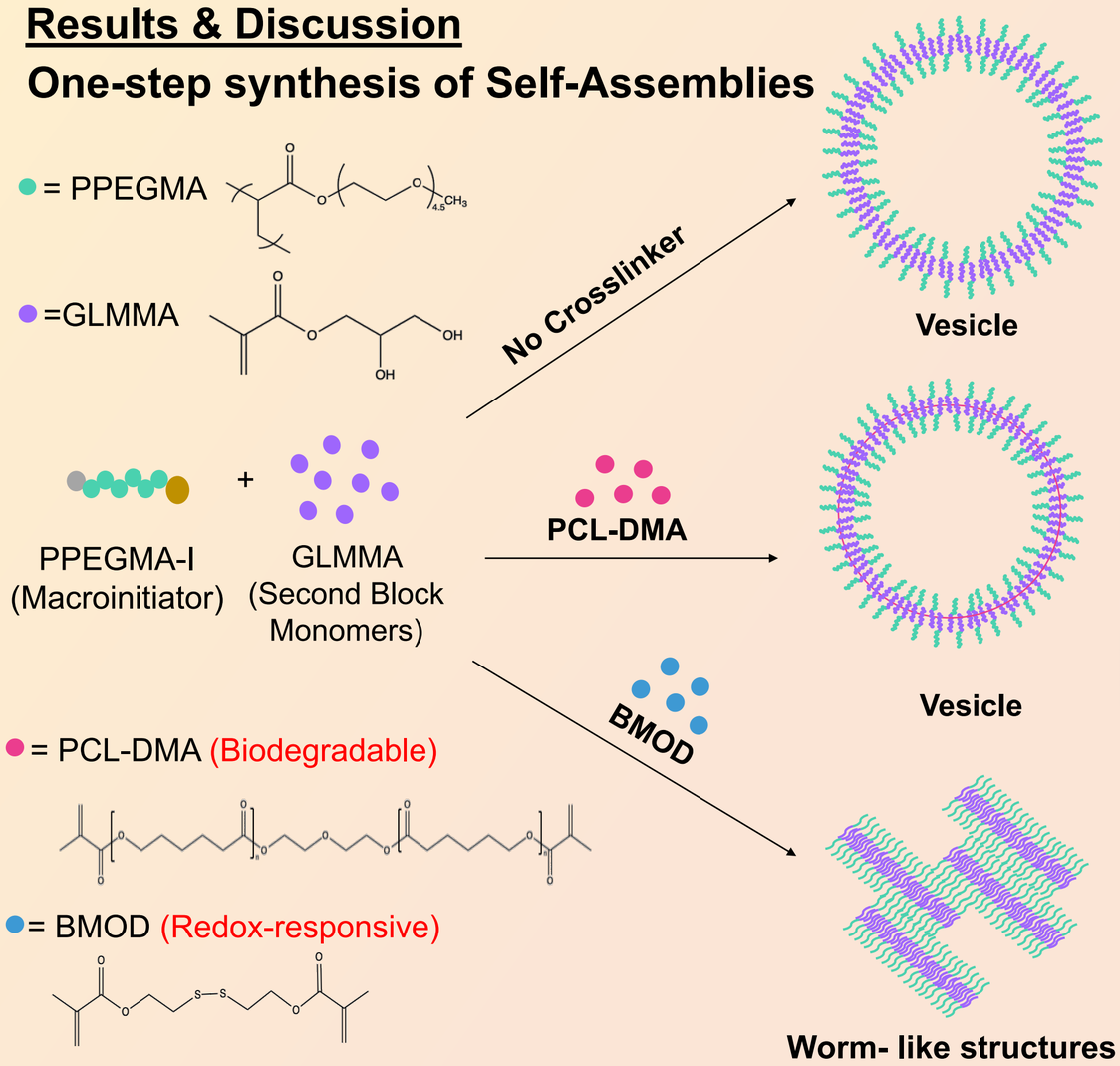
Advantages of PISA:
- Polymer concentration can be increased up to 10 to 60 WT%.[2]

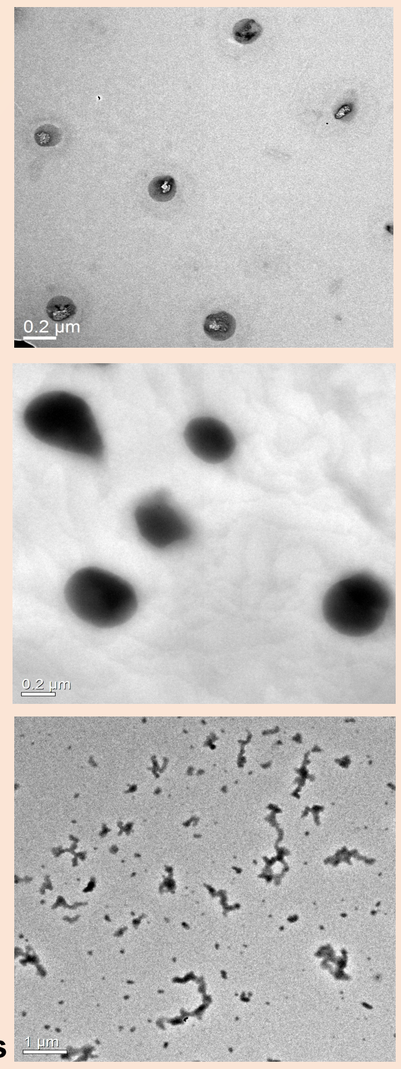
Polymerization Induced Self-Assembly



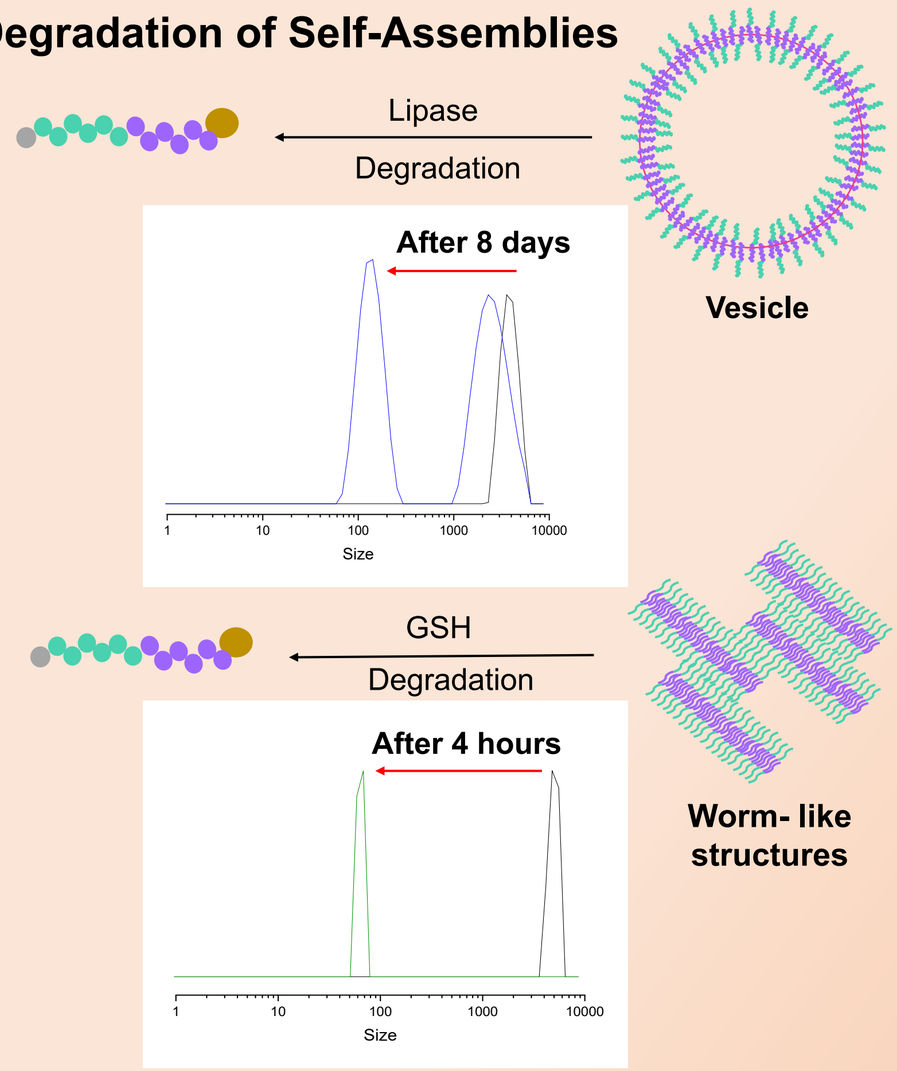
Results & Discussion

One-step synthesis of Self-Assemblies





Degradation of Self-Assemblies



Summary

- Stimuli-responsive vesicles degrade in presence of pH, temperature or external stimuli.
- Synthesized and self-assembled in biorenewable α-MeTHF solvent in a single step.
- Biodegradable and redox-responsive crosslinkers (PCL-DMA and BMOD) used.

References

1. Phan, H.; Taresco, V.; Penelle, J.; Couturaud, B. *Biomaterials Science* **2021,** *9* (1), 38-50.
2. P. B. Zetterlund , S. C. Thickett , S. Perrier , E. Bourgeat-Lami and M. Lansalot , Chem. Rev., 2015, 115 , 9745 —9800.