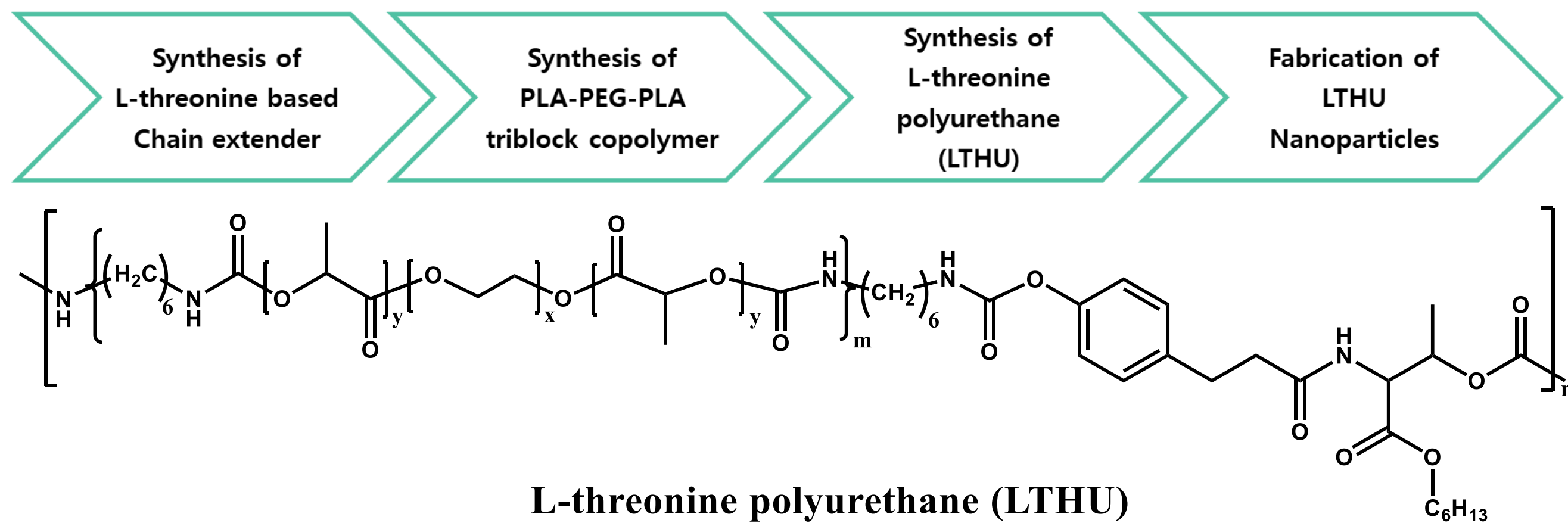


Synthesis and Characterization of L-threonine Polyurethane (LTHU) Nanoparticles for Drug Delivery System

Soojeong Choi, Seoehun Oh, Ildoo Chung*

Department of Polymer Science and Engineering, Pusan National University, Busan, Korea

Introduction

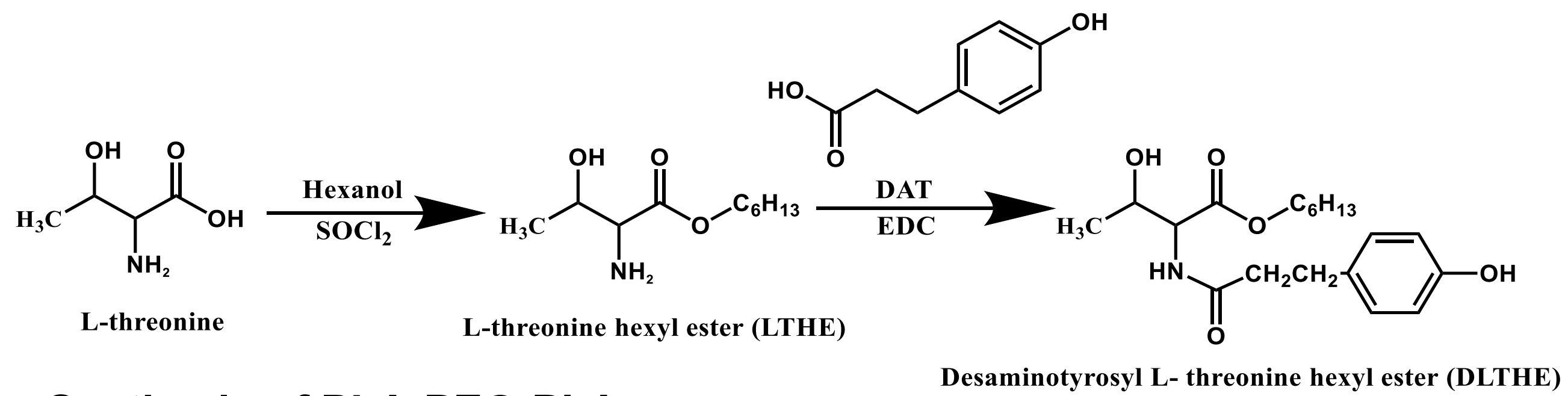


L-threonine polyurethane (LTHU)

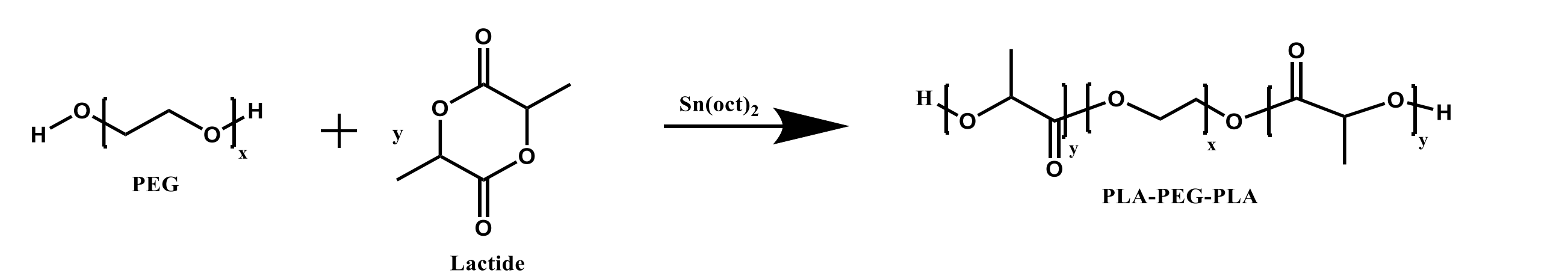
- LTHU, a biodegradable and biocompatible polyurethane was synthesized using amino acid-based chain extender (DLTHE) and biomass-based polymer, PLA-PEG-PLA.
- LTHU has ester bonds and amide bonds in the backbone and was designed to be hydrolyzed and enzymatically degraded.
- Using LTHU, a sustained release drug carrier of carboplatin, an anticancer drug, was fabricated by double emulsion solvent evaporation method.

Experimental

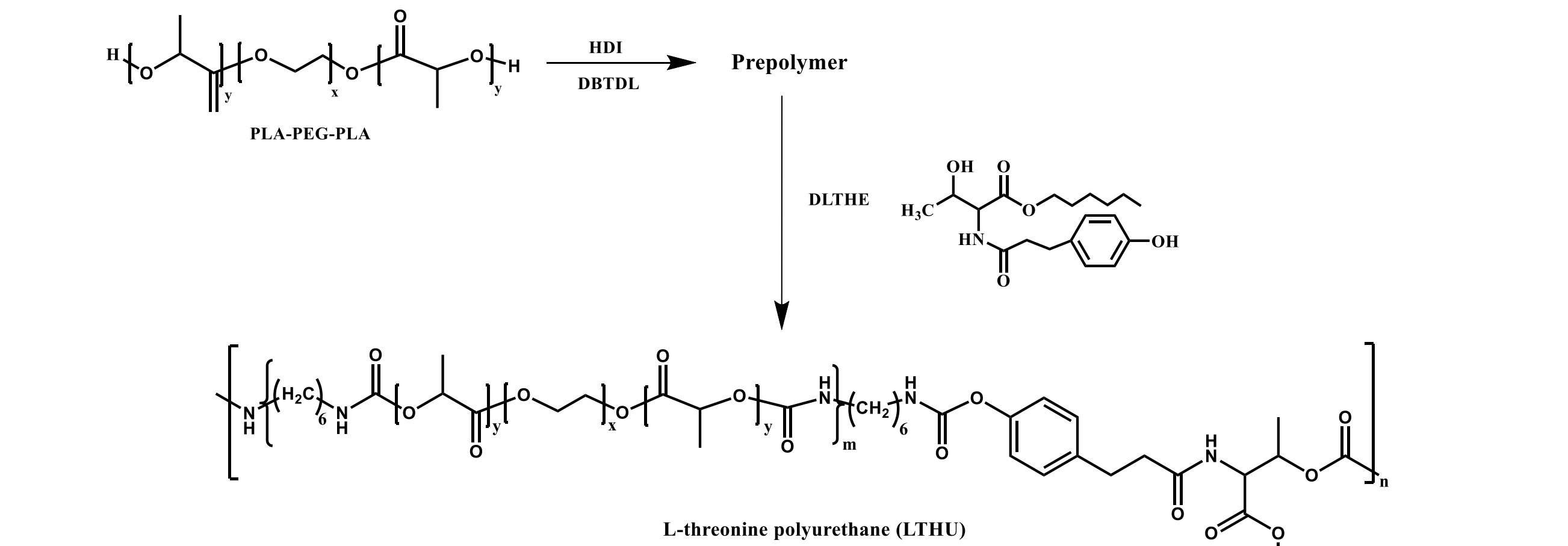
Synthesis of desaminotyrosyl L-threonine hexyl ester (DLTHE)



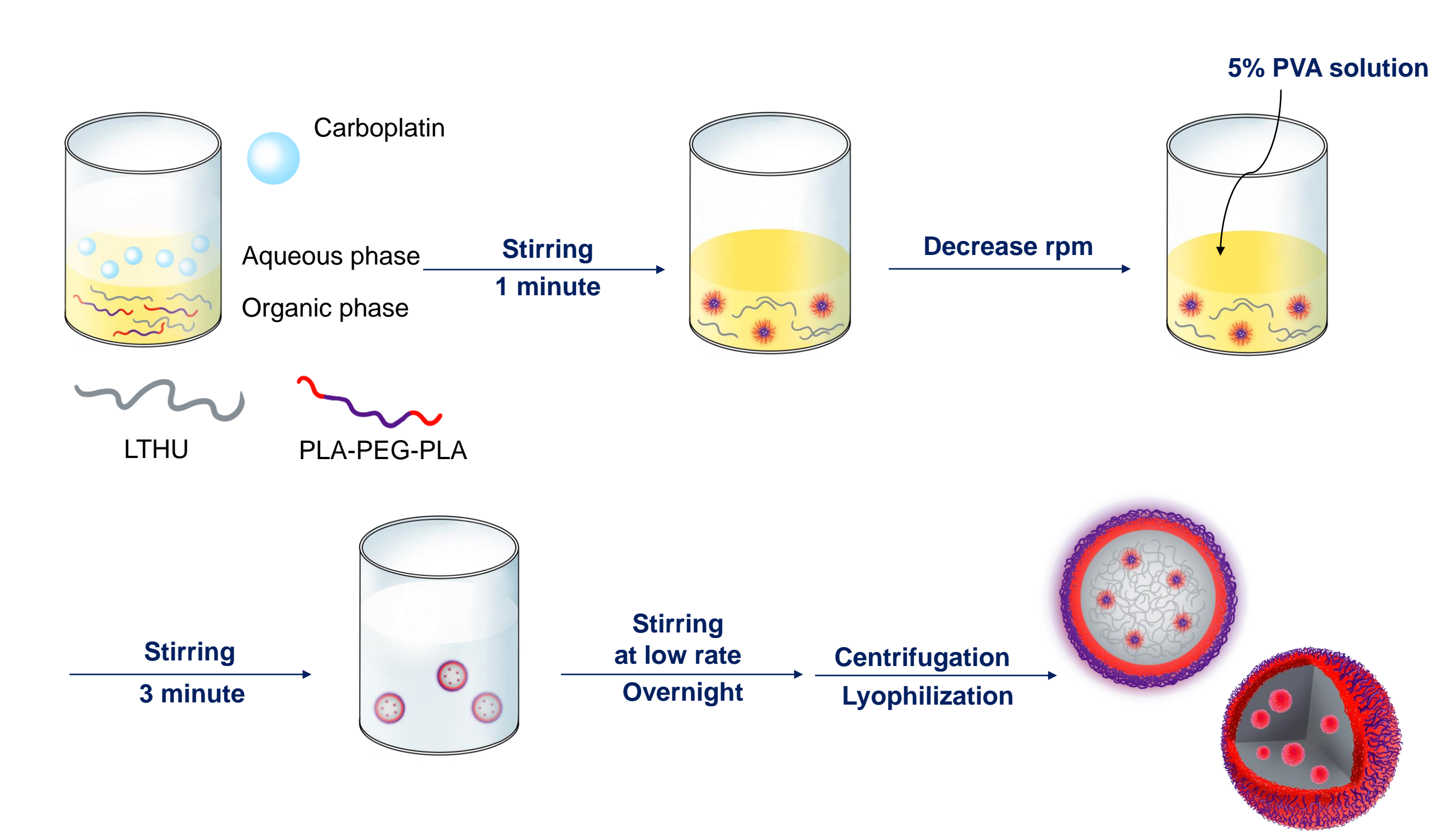
Synthesis of PLA-PEG-PLA



Synthesis of L-Threonine Polyurethane (LTHU)



Fabrication of LTHU nanoparticles by double emulsion technique



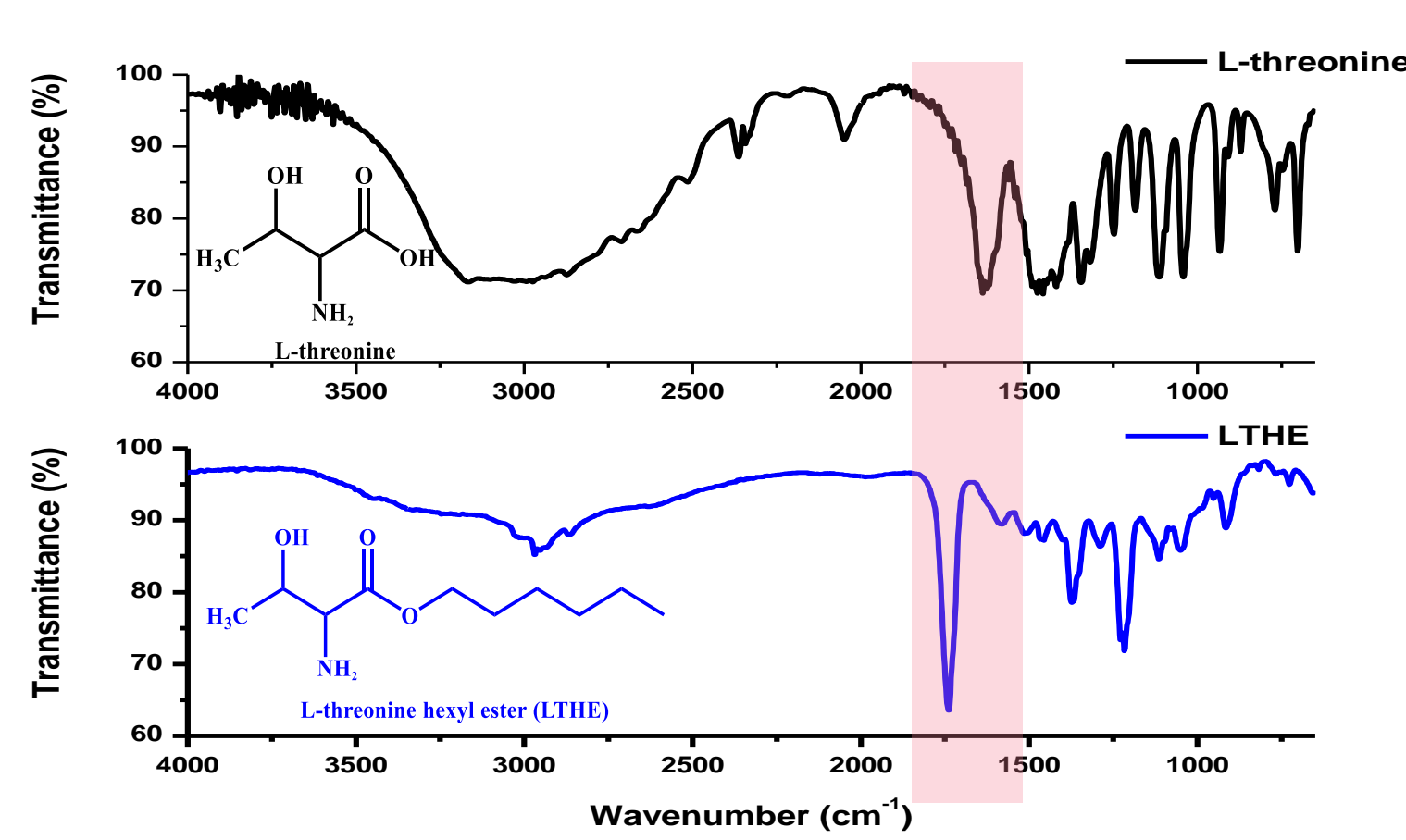
Conclusion

- Synthetic processes were confirmed by H-NMR, C-NMR, and FT-IR spectroscopies, and molecular weights and polydispersity of PLA-PEG-PLA and LTHU were investigated by GPC analysis.
- The thermal property and crystal structure of PLA-PEG-PLA were analyzed by DSC and XRD respectively.
- The morphology and size of nanoparticles were characterized by DLS, FE-SEM, TEM, and fluorescence microscope, and it was confirmed that spherical particles smaller than 200 nm were fabricated.
- A maximum of 4.01 wt% of carboplatin was loaded into the nanoparticles, and the maximum value of encapsulation efficiency was also found to be 87.2%.
- In vitro cumulative drug release study demonstrated that CLNP maintained sustained release behavior for 14 days and also it was confirmed that LTHU nanoparticles were maintained stably through the physical stability assay.
- These results suggested the possibility of application of LTHU nanoparticles loading carboplatin as sustained drug carriers.

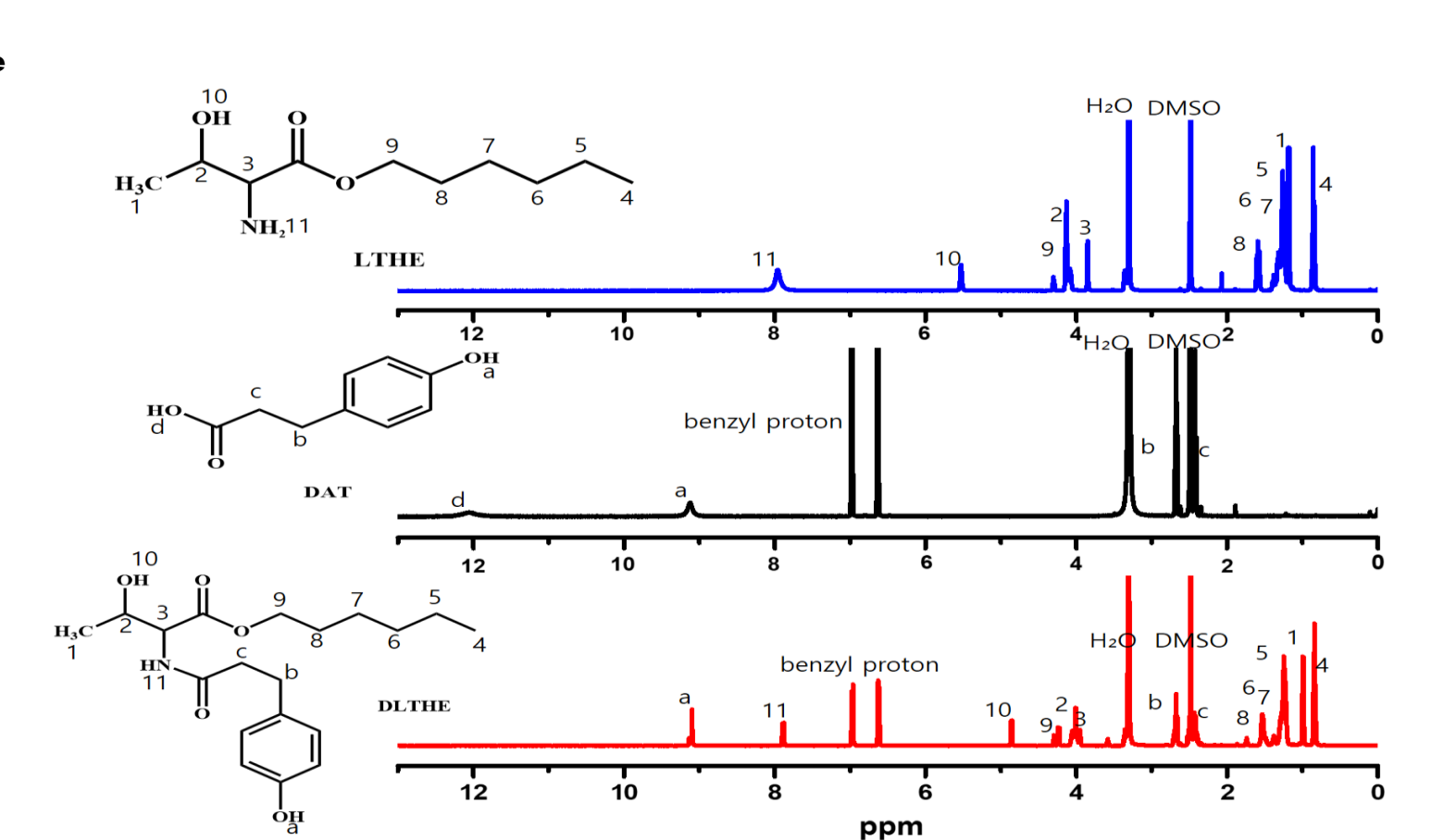
Results and Discussion

LTHE & DLTHE

FT-IR

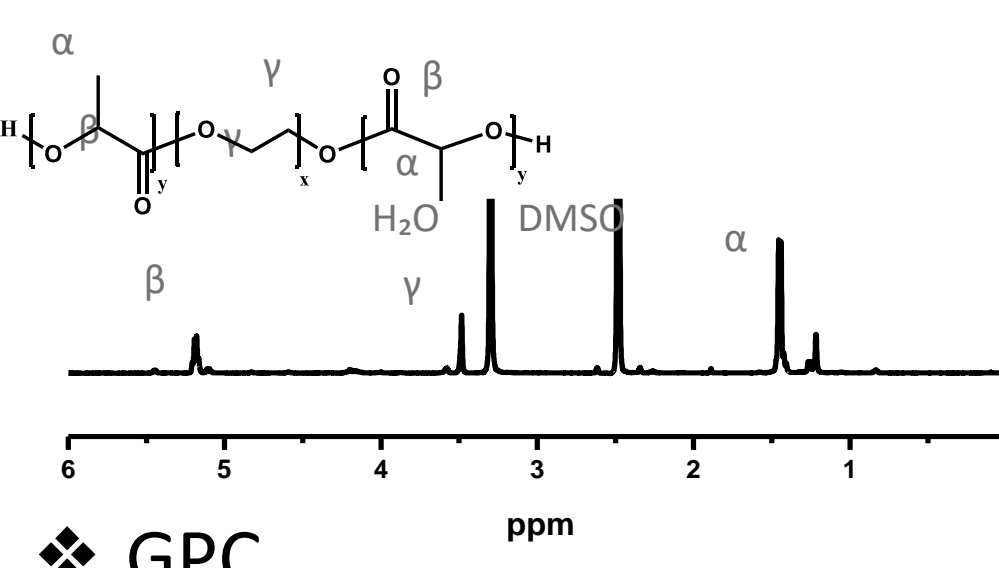


¹H-NMR

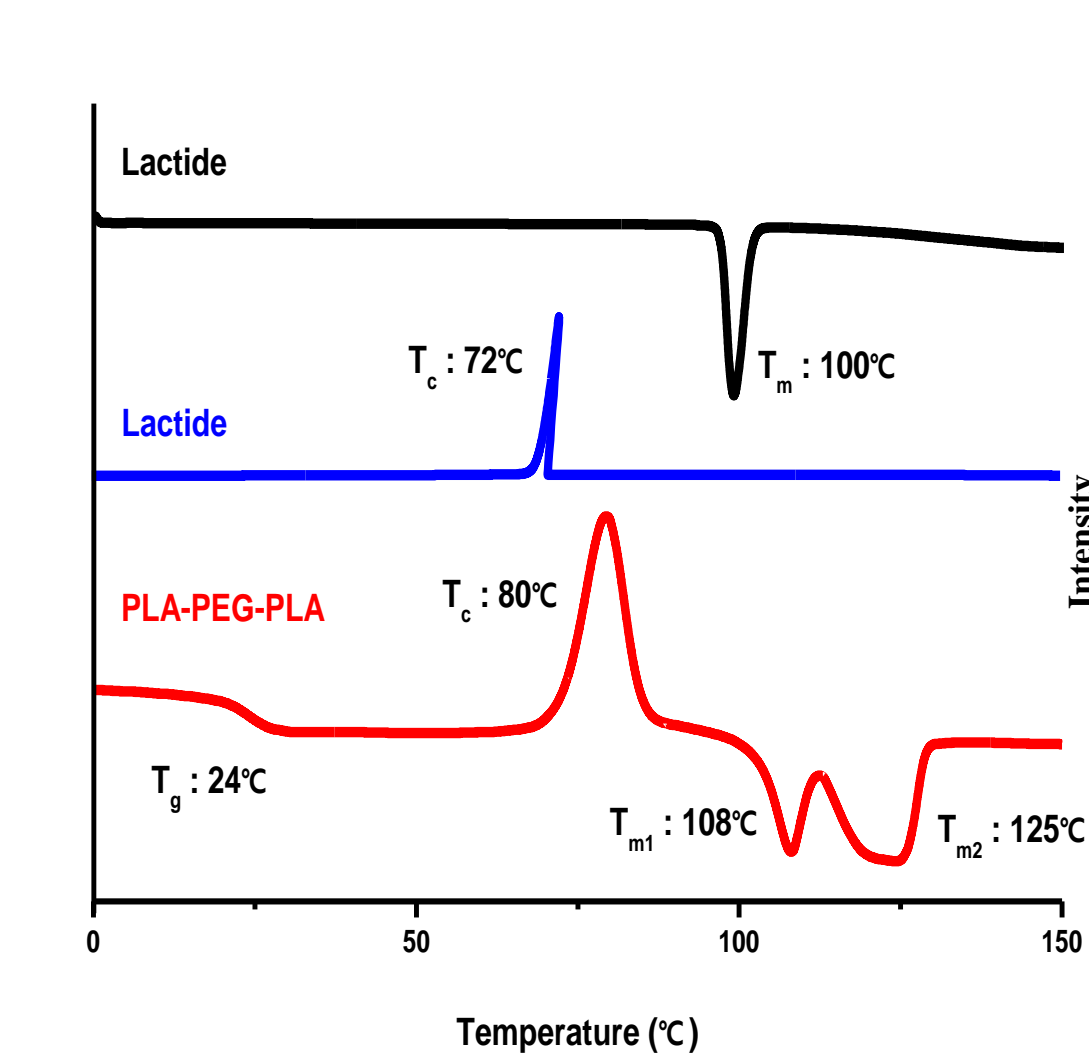


PLA-PEG-PLA

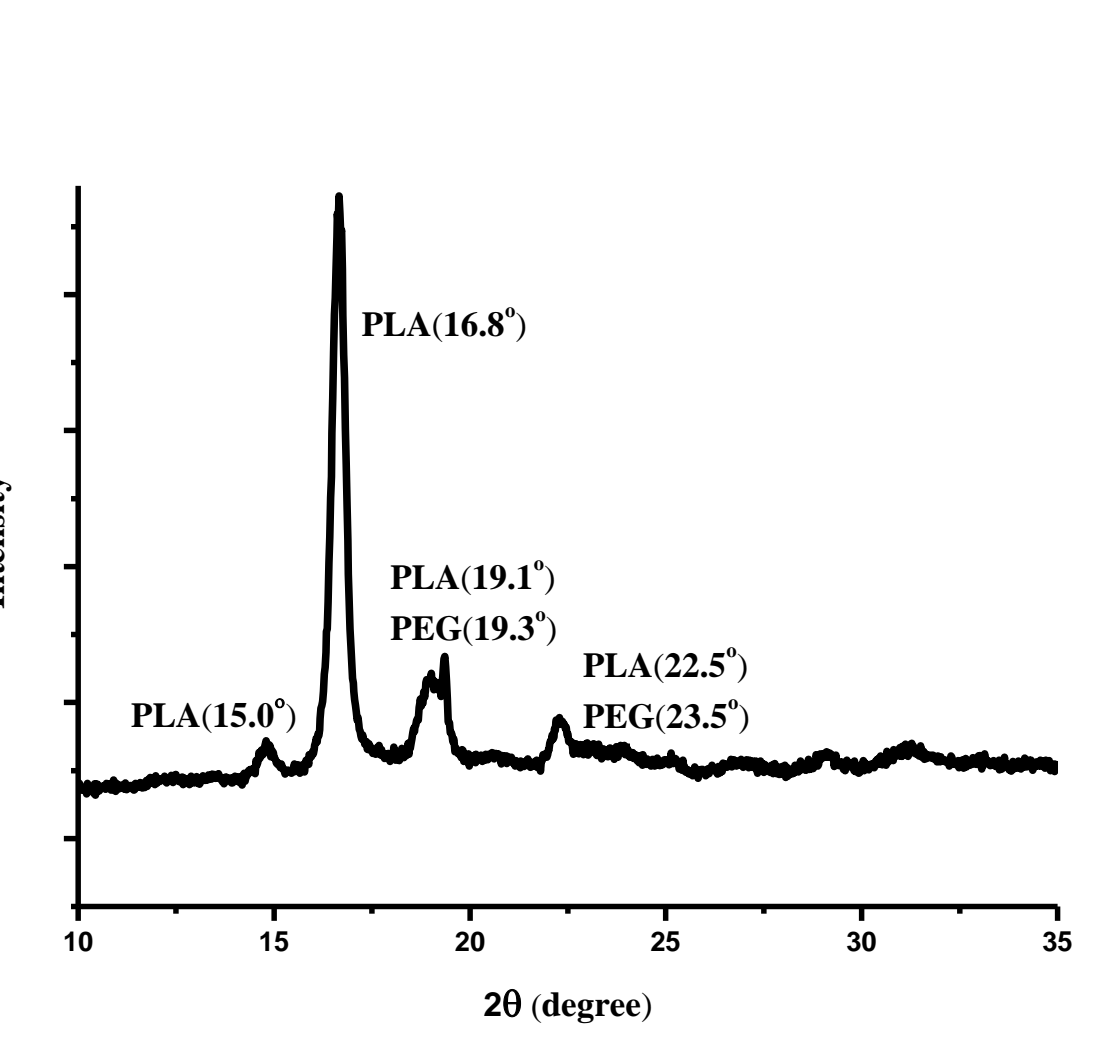
¹H-NMR



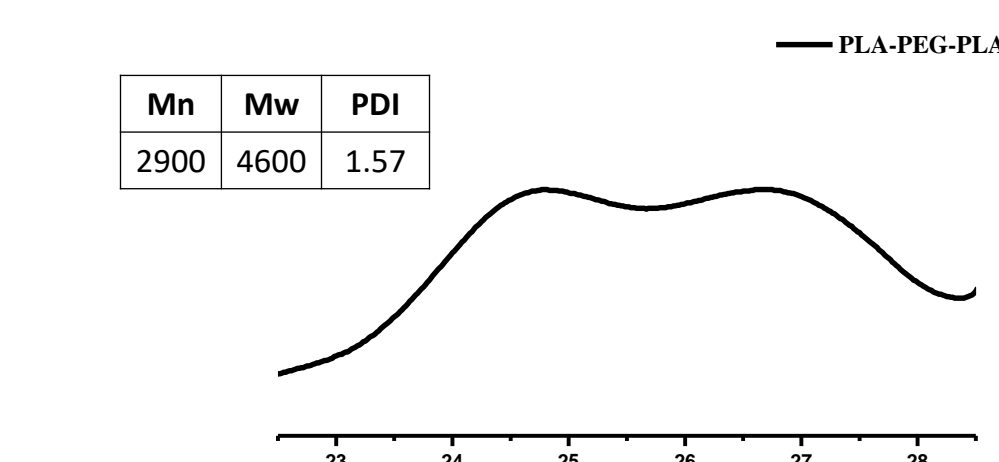
DSC



XRD

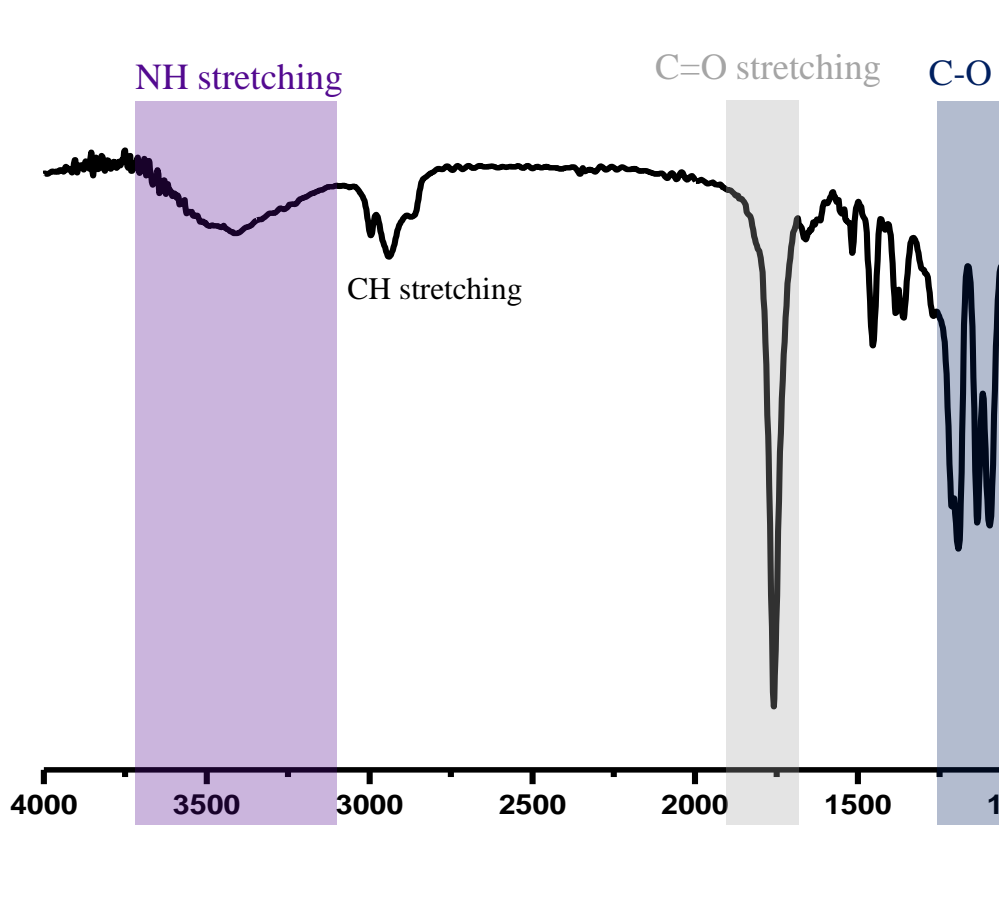


GPC

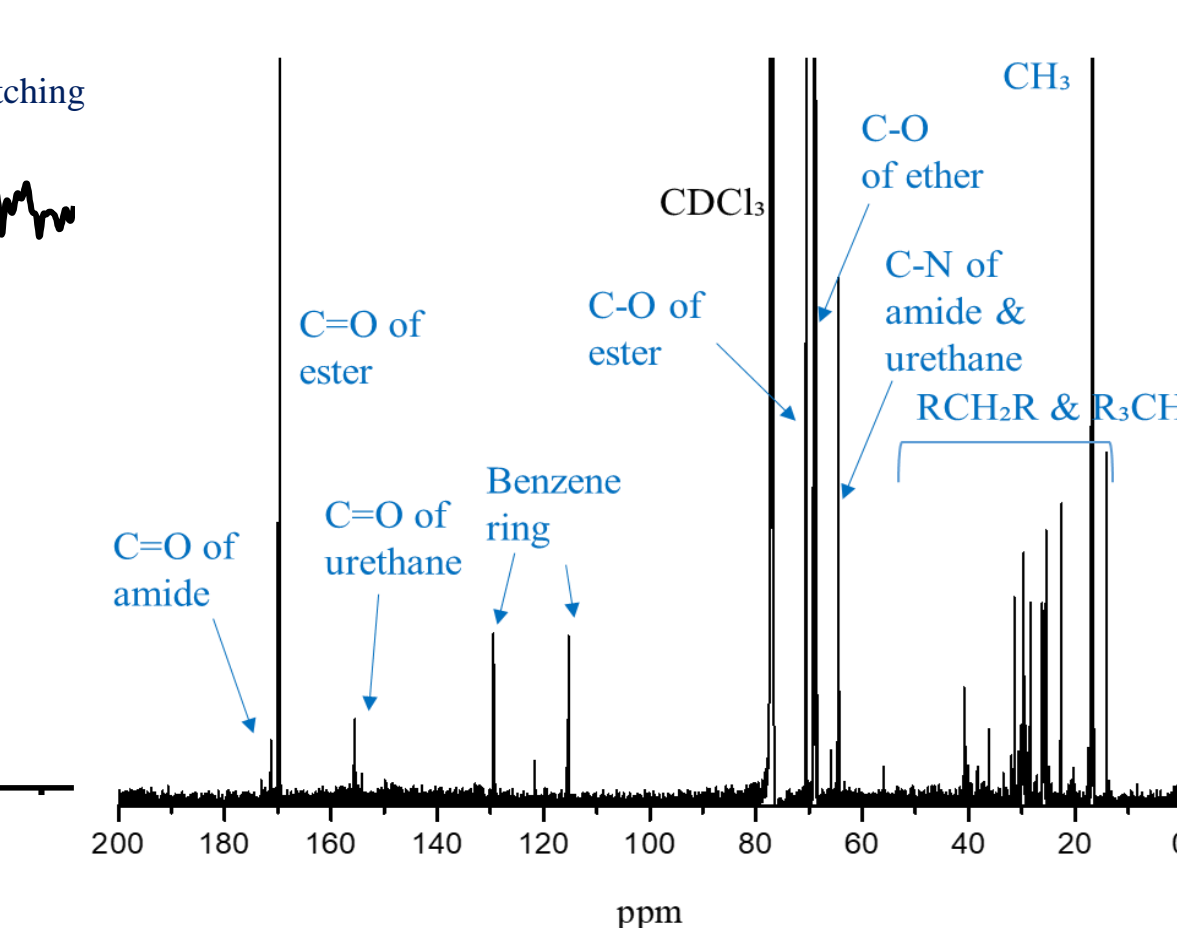


LTHU

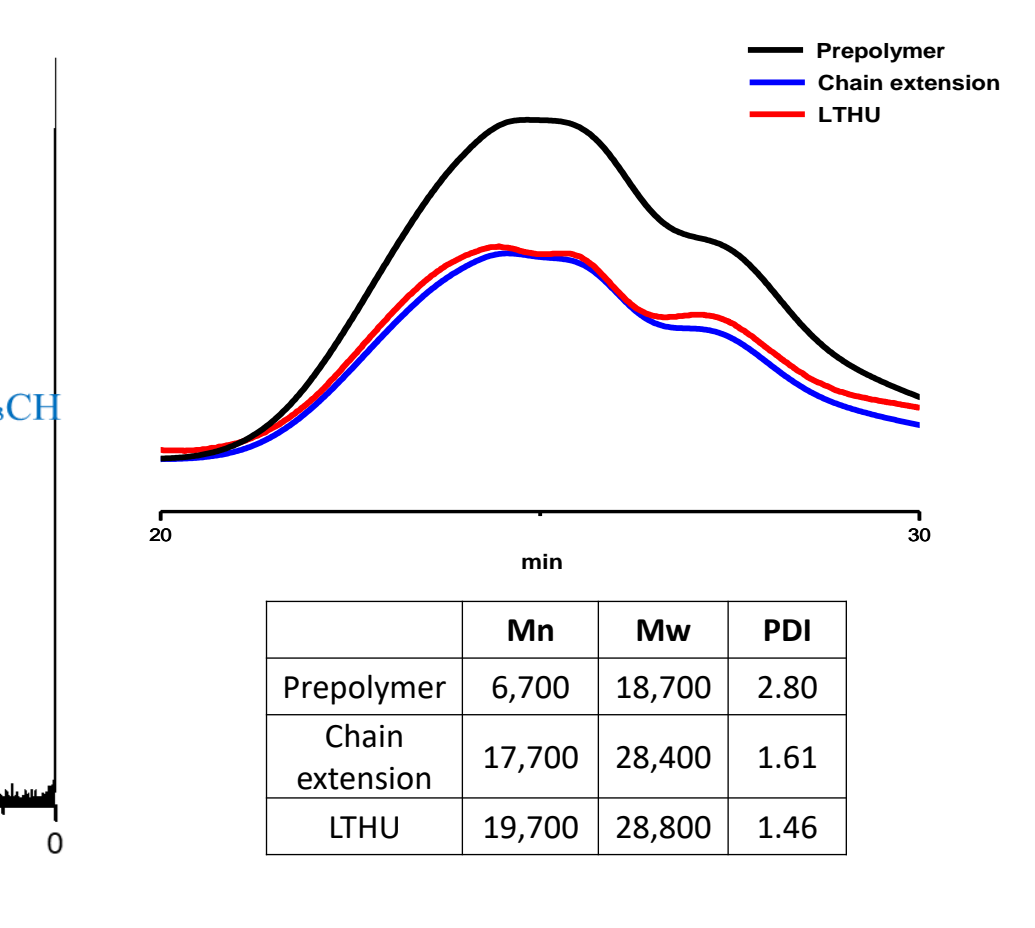
FT-IR



¹³C-NMR

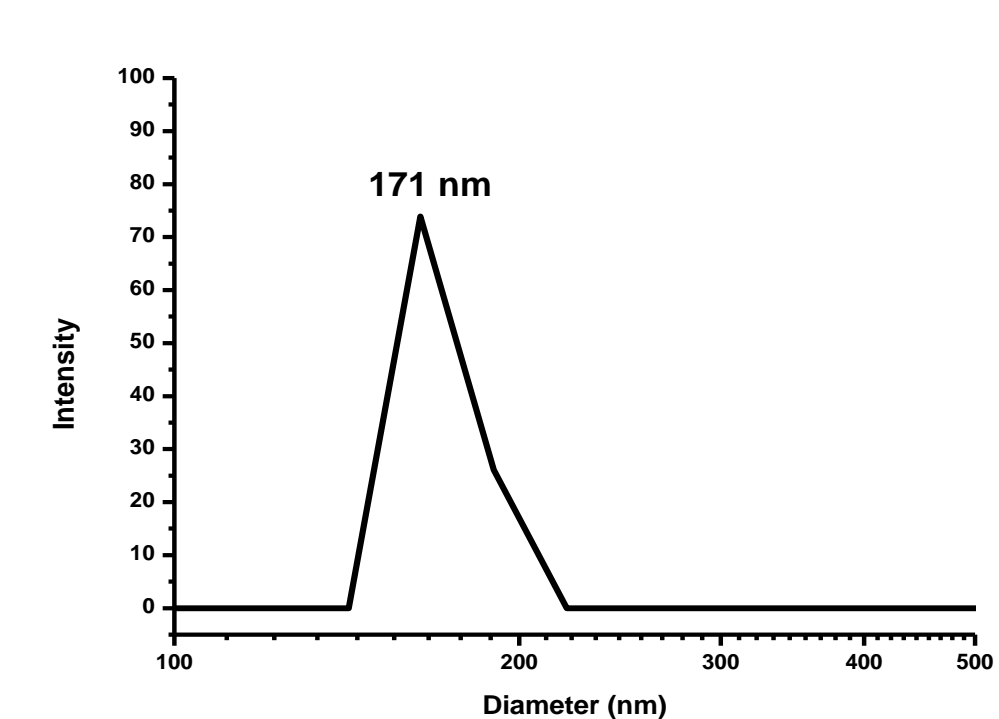


GPC

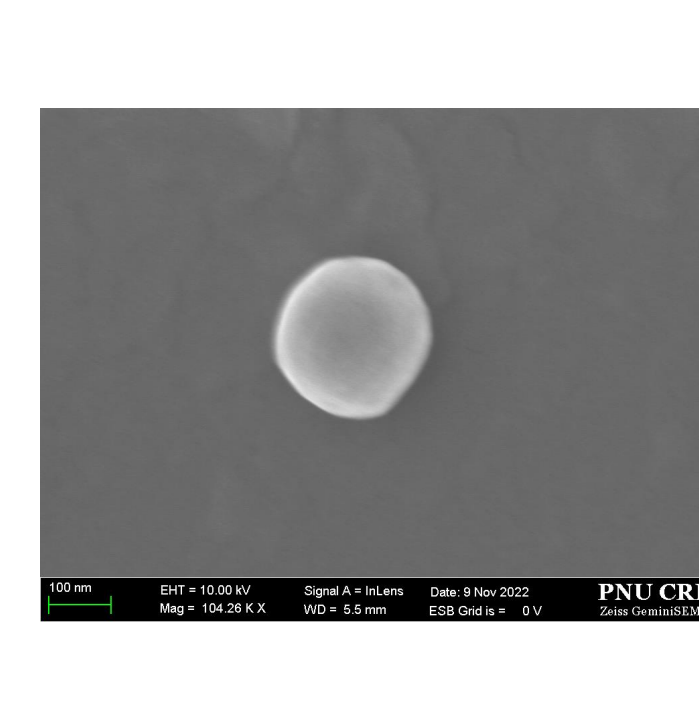


Blank LTHU Nanoparticles

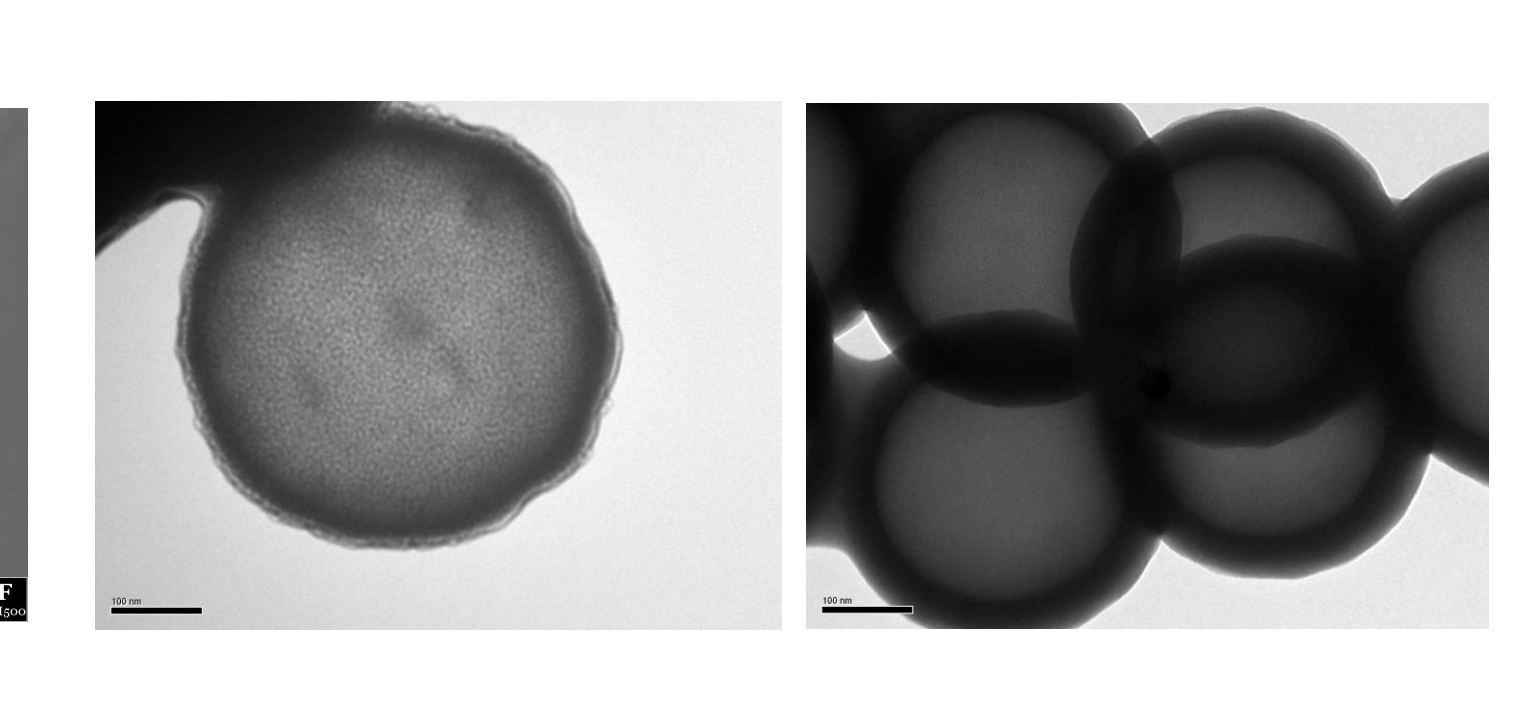
DLS



FE-SEM

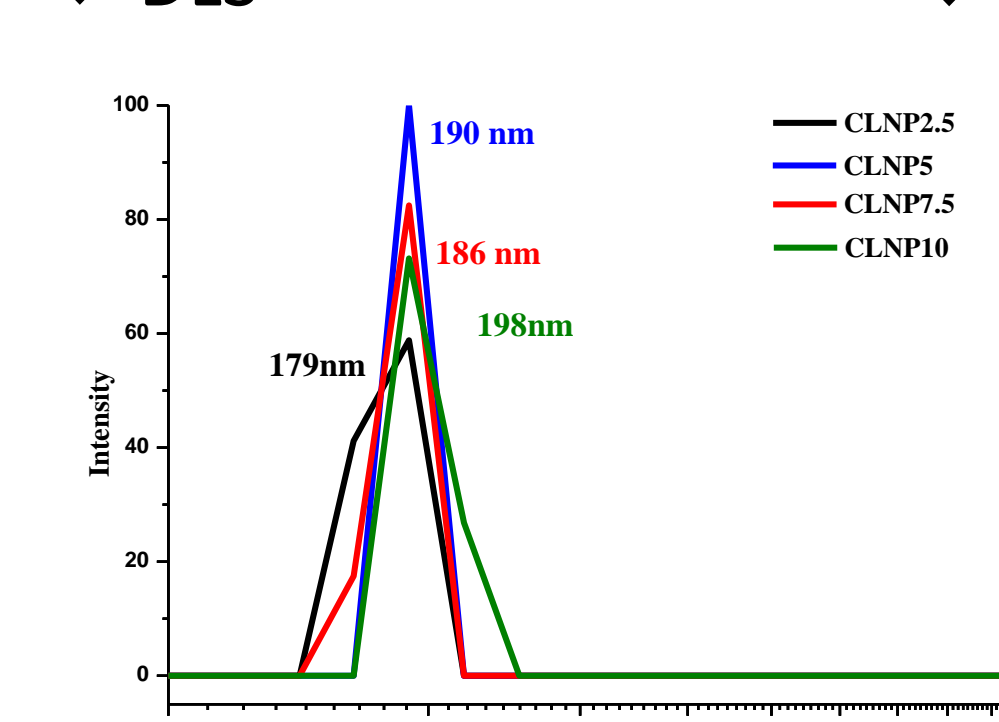


TEM

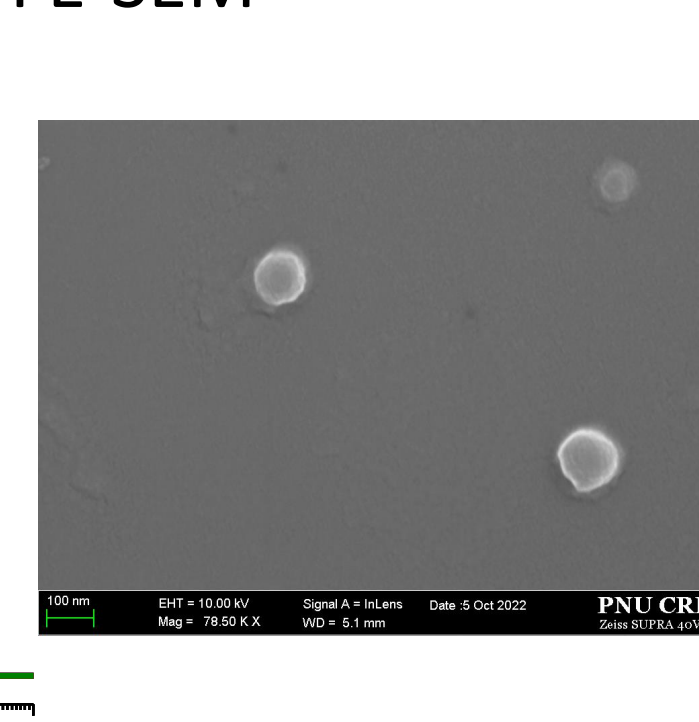


Carboplatin loaded LTHU Nanoparticles (CLNP)

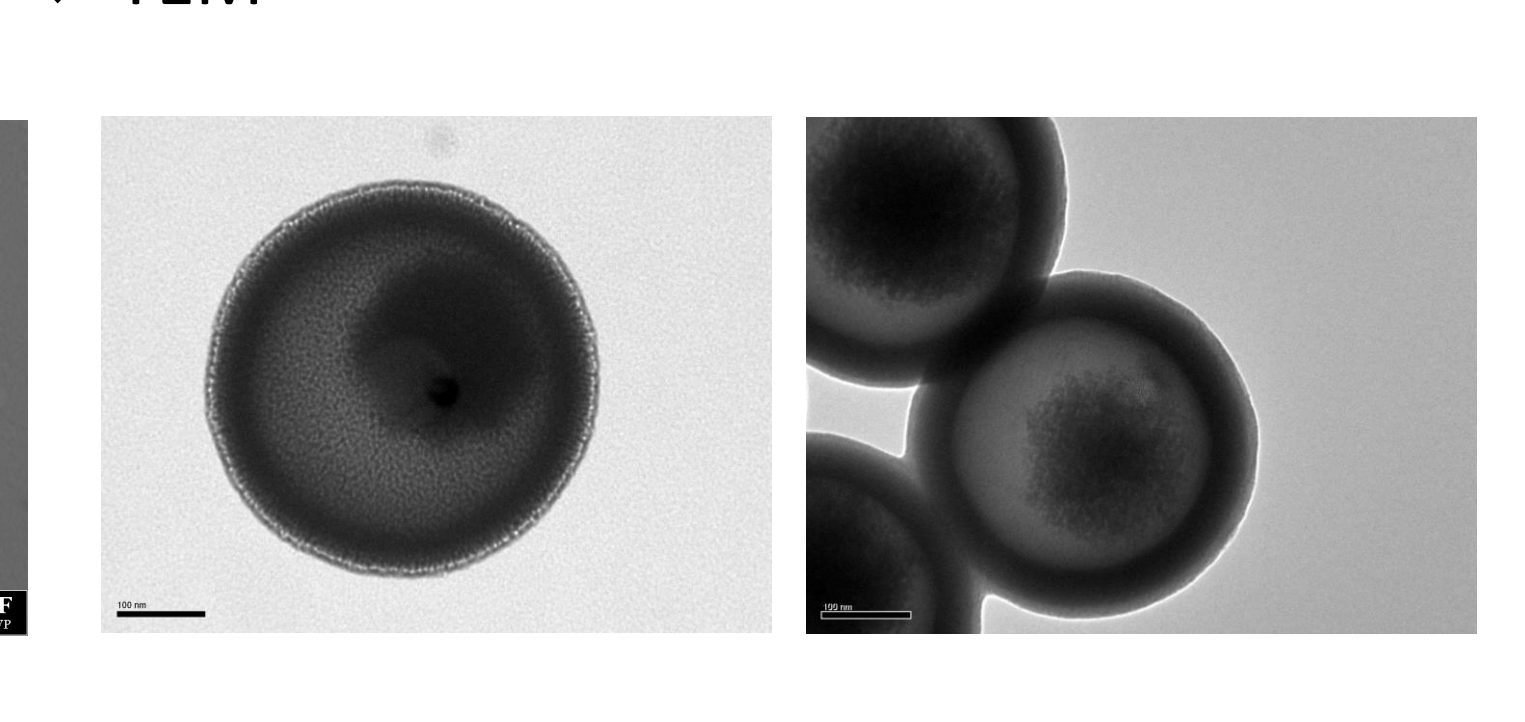
DLS



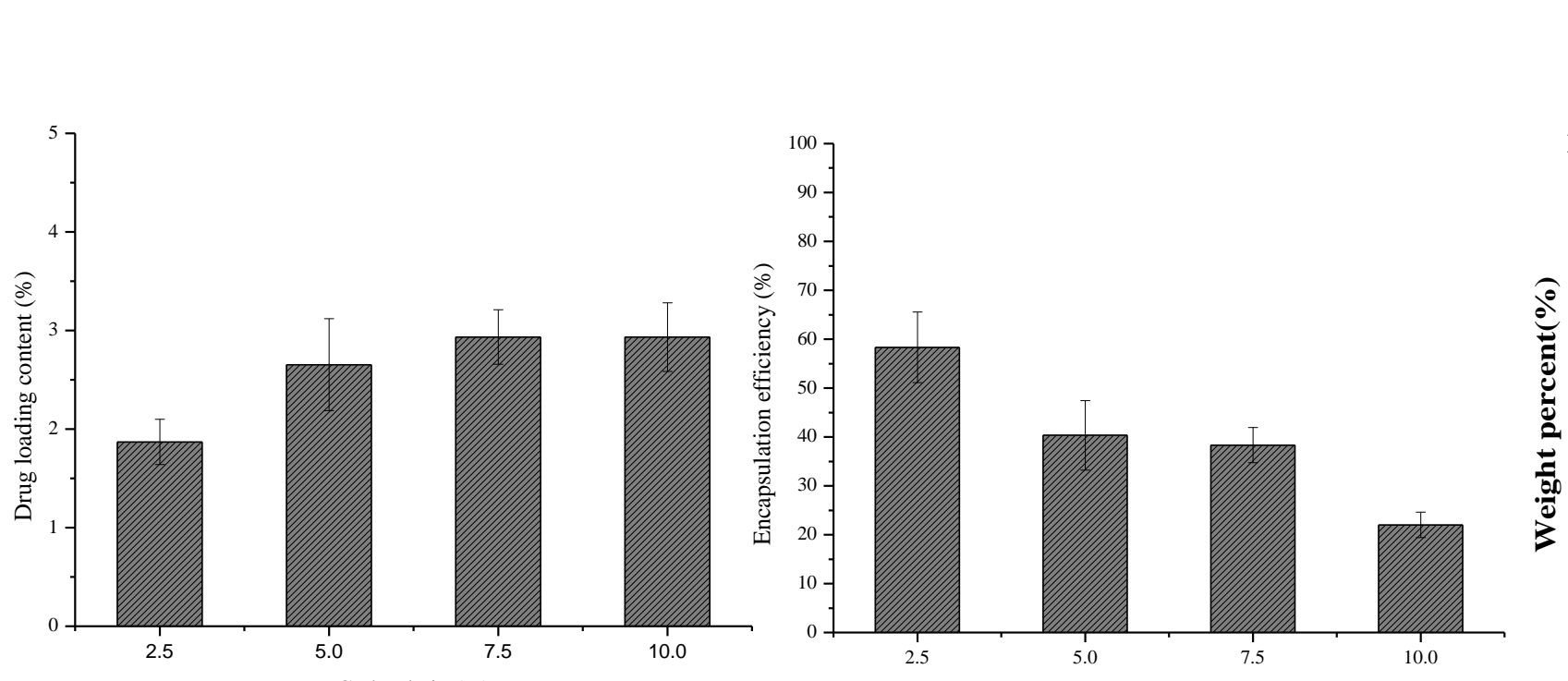
FE-SEM



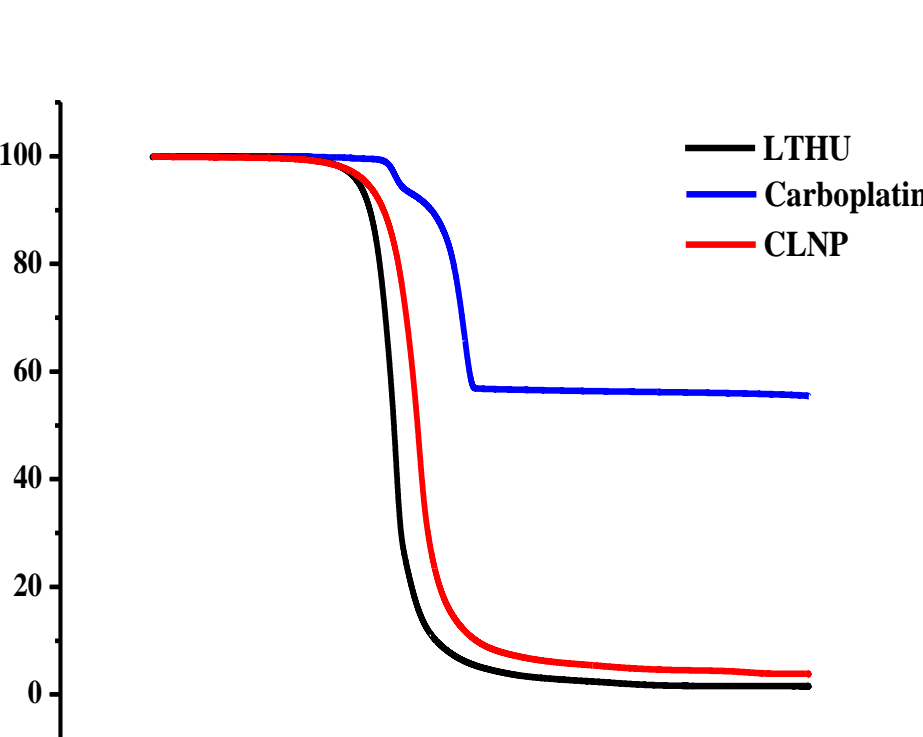
TEM



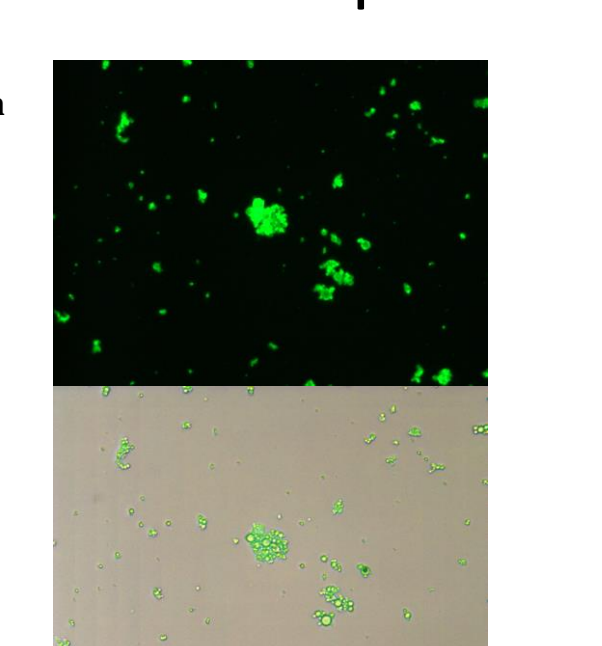
Drug loading content & encapsulation efficiency



TGA



Fluorescence microscope



In vitro cumulative release & stability of NPs in PBS

