

Effect of Molecular Weight and Graphene Oxide on Polyurethane/Graphene Oxide Nanocomposite series

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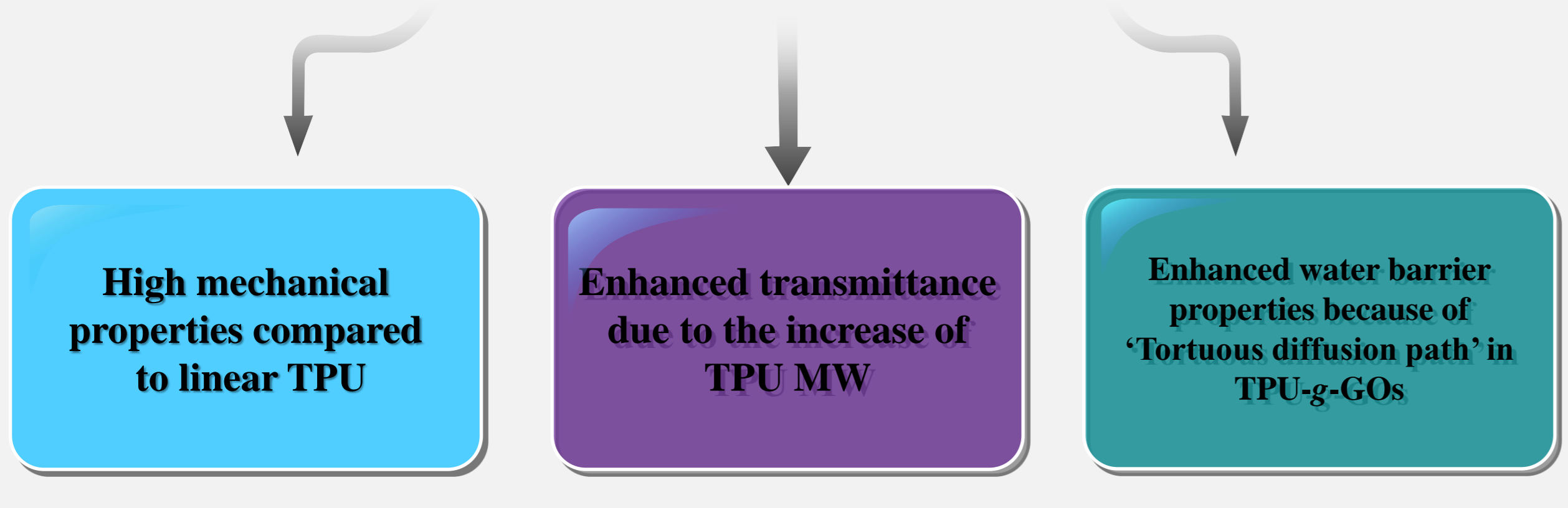
Abstract

Thermoplastic polyurethane (TPU) series based on poly(tetramethylene glycol) (PTMG 1000) as a polyol and methylene diphenyl diisocyanate (MDI) as an isocyanate were synthesized based on the various molecular weight formulations. Graphene oxide (GO) sheets were chemically grafted with allophanate-functionalized TPUs. Mechanical and thermal properties of TPU grafted graphene oxide sheet (TPU-g-GO) were systematically evaluated. Transmittance of individual TPU-g-GO nanocomposites were diversely changed from 79.72 to 90.15 %, by the addition of stoichiometric GO based on TPU with different MW. TPU-g-GO nanocomposites exhibited water vapor permeability values in the range of 2.6 to 96 g/m²·day. TPU-g-GO films will be attracted extensive attention as the potential possibility of high-performance films for electrical and electrochemical applications.

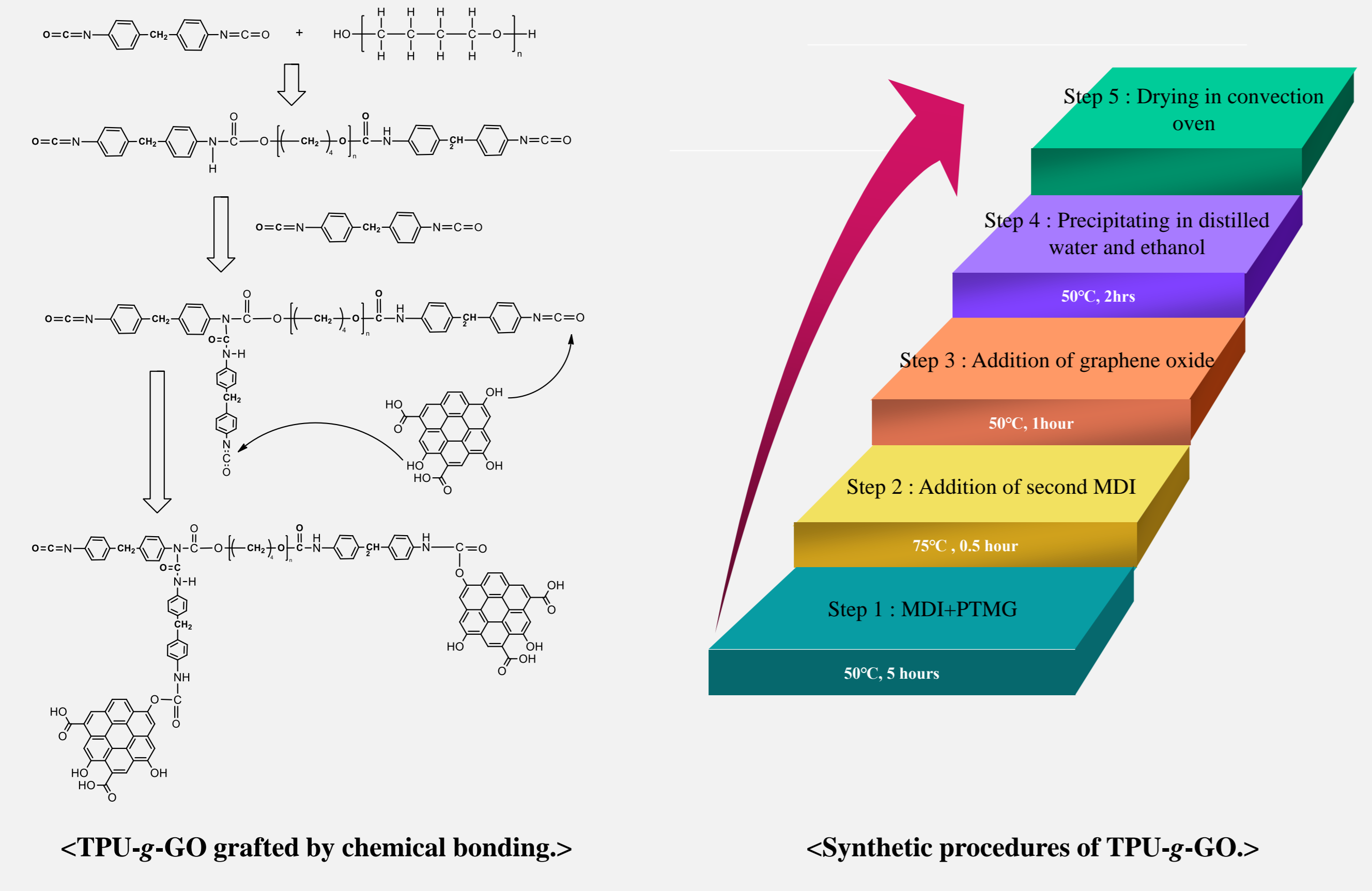
Objective

1. To synthesize various TPU series composed of various MW by using PTMG as a polyol and MDI as an isocyanate.
2. To evaluate mechanical and thermal properties of TPU grafted with the chemically functionalized GO.
3. To achieve a specific TPU-g-GO with the relatively high mechanical and optical properties comparing to the linear PU.
4. To analyze the water barrier properties of TPU-g-GOs by relationship between TPU MW and GO contents.

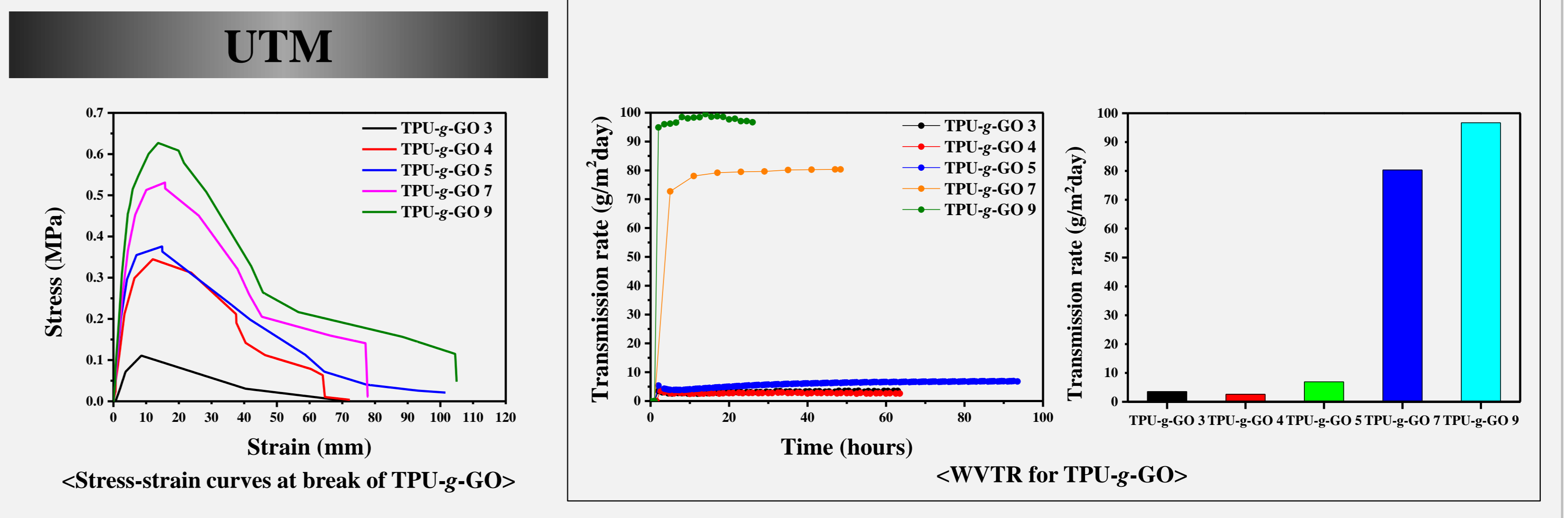
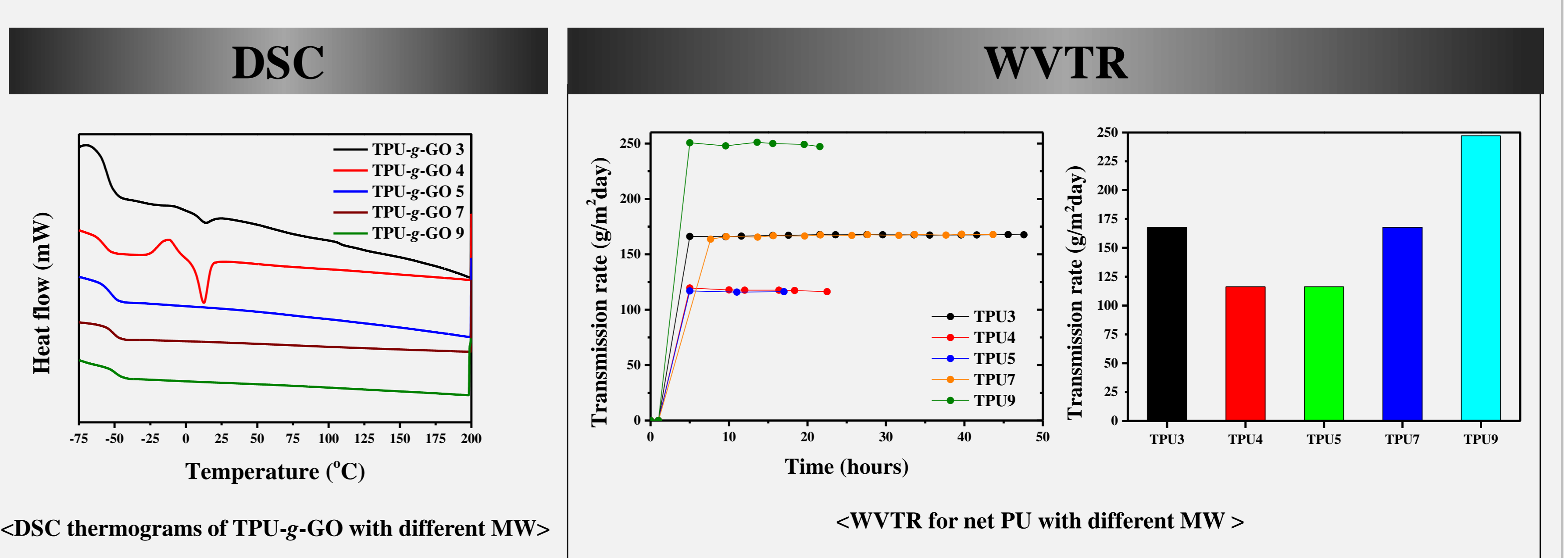
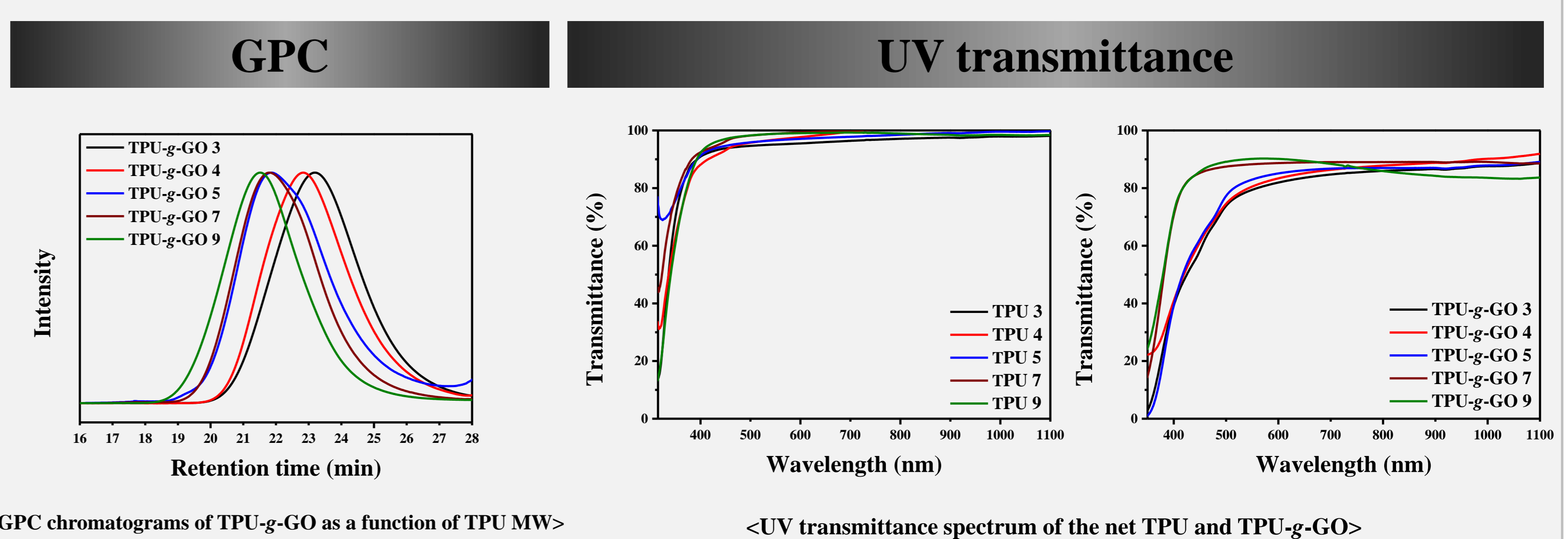
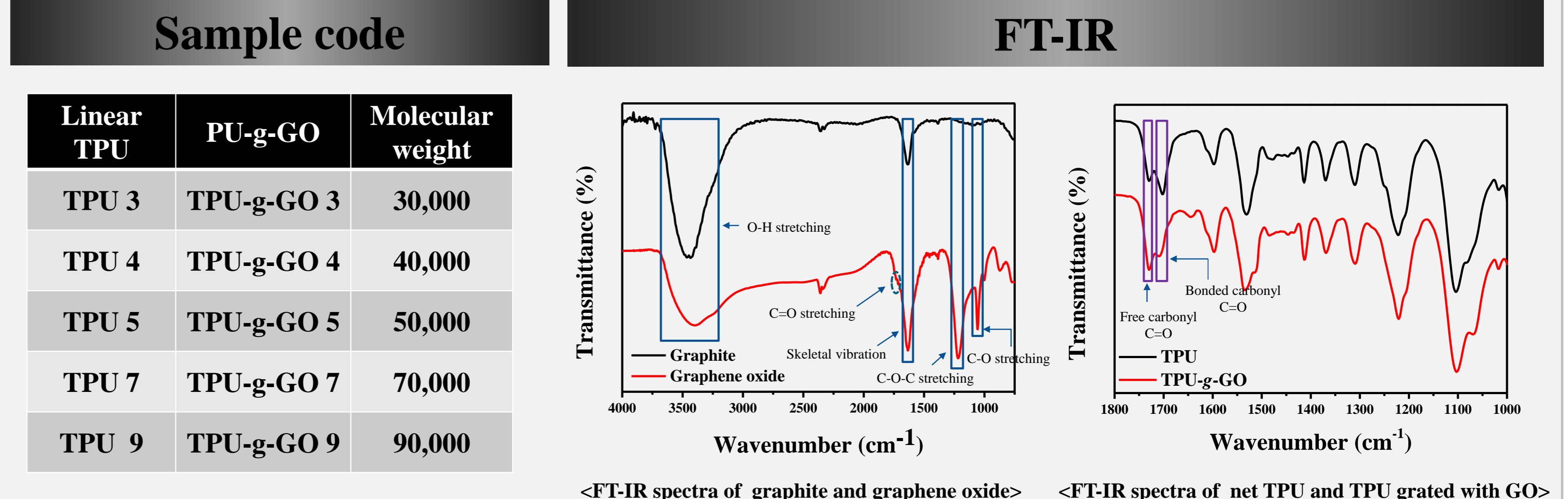
Preparation of TPU grafted with graphene oxide



Experimental



Results



Conclusion

- The successful graft-reaction between TPU and GO using allophanate functional groups.
- The improved mechanical properties of TPU-g-GO as a function of TPU MW at a fixed GO ratio.
- The special optical properties of the TPU-g-GO with increasing TPU MW (UV transmittance : 79.72 to 90.15 %)
- Good barrier property of the TPU-g-GO as high-performance film. (WVTR : 2.6 g/m²·day)

Acknowledgement

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